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Beauty: a bioform of storytelling?

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Abstract – According to twentieth-century experimental psychology, beauty consisted mainly in the recognition of a host of prototypical forms, so perceiving something average and generic aroused a sense of reassuring familiarity. The recent discovery of the principles of Darwinism, above all by neuro-scientists and bio-neurologists, on the other hand, suggested the opposite, namely that beauty is a form of evolutionary fitness: a sort of storytelling used firstly in the animal kingdom, then by mankind up to the Late Stone Age, in which males tried to persuade a female to mate. The recent theory of the so-called 'period-eye' has shown the constant influence of our surroundings on our perception of what is beautiful, confirming the neo-Darwin theories, in the light of historical and social mechanisms, not only bio-evolutionary.

Keywords – beauty; aesthetic perception; prototypicality; evolutionary fitness; period-eye; rewarding system; peak shift; storytelling.

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1. Beauty and neo-Darwinism

In recent years, following the pioneeristic studies by Daniel E. Berlyne on the cognitive and perceptive mechanisms of beauty, which were completed half a century ago, in experimental psychology and in the field of neuro-science, it has become an established idea that we would rate highly, in terms of beauty, those forms that do not deviate greatly from a prototypical idea contained in neural networks linked to our individual memory.

Aesthetic pleasure would therefore depend on the extent to which a natural or hand-made object, a painting, a piece of music, deviate from an *averaged model* that is consciously or unconsciously present in our *mental database*.

In this sense, the closeness to a statistic average would harbour the secret of a fortunate emotional intensity that only beauty can give us, as if emotions and memories were always an essential part of the categorisation processes of our brain (beautiful/ugly, euphoric/dysphoric, pleasant/unpleasant).

Now, if prototypes were formed on the basis of individual memory, with its variable intensities of emotivity, what consequences would there be for an idea of beauty centred around the closeness to such prototypes? Presumably there will be a certain level of divergence in our reactions to beauty, even without expecting a complete or anomalous divergence, given the shared evolution of mankind, similar conditions for our experiences etc. (Hogan 321): elements such as habit, familiarity, normotypicality, and the satisfaction in achieving our daily expectations would offer each individual those indistinguishable confirmations and reassurances that essentially represent the concept of pleasure.

Even those who have studied all these aspects, relating them to a specific field of perception have reached similar conclusions: Berridge and Kringelbach, for example, found that the sensation of pleasure obtained when listening to music is due to the fact that we can anticipate the sequences of notes, in the sense that our expectations regarding the sequences of rhythmic and harmonic sequences would be guaranteed if, and only if, the piece of music assumes an 'ordinary' and 'foreseeable' trend (Berridge and Kringelbach 300).

In particular, H. Leder maintains that familiarising ourselves with something that repeats itself considerably boosts its positive associations (if there were any negative associations) and produces mnemonic associations that reduce any uncertainty in the judgement of its appearance and ultimately facilitate the formation of prototypical classes, given that Leder defines prototypicality as the coefficient of representation of an object compared with other elements in the same class (Leder *et al.* 489 ff.): a prototype is not only the perfect incarnation of the characteristics of the group of objects with which it is associated, but is constructed through experience. Some believe that even the aesthetic gradient aroused by cubist painting is due to the prototypising trend of the most recurring shapes (spheres, pyramids and rectangles) (Hekkert, van Wieringen) and assert that cubists prefer to base their works on the concept of prototypicality, which is considered as the immediacy and ease of recognition of the object portrayed in the painting.

This is naturally a variable (as many others considered herein), which is very difficult to quantify, as it depends on individual scales based on individual experience.

The same conclusion has been reached by scholars who have carried out perceptive experiments in relation to the so-called golden ratio – the very basis of ideal beauty since the 1:1.618 of the Ancient Greeks – who believe that when people observed golden ratios, the visual areas in the lateral occipital cortex (LOC) and the lower temporary lobe (LTI) were activated to a greater extent: these are sensitive not so much to the shape of objects and the perception of the body and its parts, but to a greater regularity of the perceived morphological characteristics.

Moreover, this process is also confirmed by a superior activity also of the mnemonic functions of the hippocampus, which activate a figurative comparison with data that have been previously gathered and stored as being correct and pleasant: this is an activity of the memory and the *rewarding* mechanism that is clearly aroused by a cerebral recovery of movements that are 'archived' by the brain as necessary for spatial navigation, and can therefore only be made by a correctly proportioned body (Di Dio et al.).

Christoph Redies, Director of the Institute of Anatomy of the University of Jena made an attempt to negotiate the positions in such a way that the neural model of elaboration of aesthetic experience is made up of two main elements: the first refers to the *perception* of the shape of an artefact, and is thus a universal mechanism located in the primary visual cortex; the second regards the *cognition* of its contents, of the context in which the work of art is presented/created and of the intentions of the individual (creator or user), and is thus an individual top-down mechanism that varies according to personal experience.

Aesthetic experience would emerge when both these mechanisms are activated, in other words when a correct perception of the item being viewed encounters a valid cognitive elaboration: for Redies, this binary model forms the very basis of cultural mediation of social relations and appears decisive in the mediation of formalist perceptive approaches (based on the idea that the artefact is innately beautiful) and the contextual approaches (which privilege the priority of individual and cultural aspects in any aesthetic experience) (Redies 10-15).

In this sense, for Redies 'beauty' refers to the intrinsic property of a visual incentive, while 'aesthetic' conceptualises the individual experience that is aroused by a work of art and the neural elaboration of this experience (a general sensation of pleasure that differs from sensations of *domain-specific* feels of satisfaction aroused by visual incentives in a certain 'sector', such as the sight of a face or a fashionable garment) (see figure 1).

But is this really so? Neo-Darwinism has recently offered a totally different explanation, not only because beauty becomes a form – if we were to use an oxymoron – of normotypical exaggeration, but above all because it identifies a narrative plan, a relational promise which, in *daily life*, is sometimes called sexual attraction or love.

That's right. For neo-Darwinists, beauty is first and foremost a promise, an indicator of *fitness* and physical strength: to be beautiful means to be healthy, fit, able to adapt and give a better guarantee of the continuation of the species.

In this sense, beauty for Darwin was a necessarily male attribute, while females would limit themselves to responding to the aesthetic signals of the male and decode the complex, seductive semiotics.

What *case-study* should one pick for this purpose? In the ornithological world one can find the original form of beauty and 'aesthetic' courting methods that were not inherited by mammals and the human species, deviating the seductive strategies of birds towards a 'muscular' model (Mithen, *The Singing Neanderthals* 42 ff.). To be precise, in the general context of Darwinism there are three theories on aesthetic appeal.

(*i*) The first theory of Amotz Zahavi maintains that beauty – think for example of the magnificent tail feathers of the peacock – is a handicap, and that for this reason it represents

a sort of *fitness test*, as a strong physical constitution is already proof of the capacity to put up with this handicap and to guarantee the survival of the species.

Such elements of finery are *reliable* signs of *fitness*, as they demand a great deal of physical strain to be maintained.

According to this theory, aesthetic taste, pleasure and beauty are all linked to the idea of excess, useless and superfluous – this explains, in fact, the fact that courting involves an enormous expenditure also by men (engagement rings, jewellery etc.), and also the social-anthropological notions of which Bataille is fond: *dépense* and *potlatch*.

Beauty, therefore, would be a form of 'signal selection', which is rejoined indirectly to natural selection, as also indicated by the fact that men's hair does not have a pre-programmed growth limit, unlike all other forms of hair: it is in fact an 'eccentric' ornament that represents a 'réclame' for the *fitness* of its owner, who has a sufficient amount of time to make it into an ornament (Zahavi, Zahavi 24 ff.).

(*ii*) The second theory sees in beauty an indicator of immune competence, for which animals with lavish ornaments prove they are particularly resistant to parasites and thus have good survival skills.

With regard to the human body, this theory avails itself of two pieces of evidence: the purity of the skin (acne and wounds indicate organic illnesses) and the symmetry of the body (asymmetries in the face and body indicate developmental disorders or serious illnesses) are two attributes that can explain why symmetry has proved, over the years, to be one of the main candidates for embodying the very idea of beauty (Menninghaus, *Das Versprechen* 128).

(*iii*) The third theory sees in beauty indicator of *fitness*, for example in the woman, in which fertility is indicated by two elements: a particular ratio between the waist and hip measurements and a childish outline in a woman's face (known as *facial babyishness*).

The latter is an indicator of youth in women and, therefore, a higher degree of fertility, and includes high cheek bones, delicate jaws, a round mouth, large eyes, and a small nose. Also bare skin creates a totally new haptic experience in man, because compared to other mammals it allows the contact surface to be increased (Kirk et al.; Menninghaus, *Wozu Kunst?* 30).

An *authentic* neo-Darwinist like Winfried Menninghaus has recently addressed these problems and explicitly adopted this third theory, explaining in adaptive terms the current hyper-enhancement of the component of beauty.

Contrary to the 'organic' communities of yesterday in which everyone knew everything about everyone, in today's world of spatial nomadism, intense flows of migration, and multiple and 'temporary' social contacts, the *first impression* made by the physical appearance has become essential, according to Menninghaus, for recognising the attributes of personality; as if this were not enough, the decline of the large metaphysical systems have also consolidated the trend of relying on specific figures in the sector (psychotherapy, organic food suppliers etc.), and above all of delegating to beauty ancient needs to justify our existence (Steen 57 ff.).

For Darwinism, the *sense of beauty* of mankind is thus an 'evolutionary vestige', the imprint of archaic relationships between the sexes, when the aesthetic choice could still have its say in one's evolution; for Freud, on the other hand, the typical divorce of the European civilisation between sexual desire and aesthetic perception led to a transformation of the latter – which was transferred from the genital organs to the entire body, and thus to the overall image of a body covered with clothes and ornaments – into a vector of sublimation.

Although Freud shared Darwin's theory on the sexual origin of the aesthetic impulse, he underlined the productive character that was favourable to the progress of culture and civilisation, of a shift in appearance from genitals to skin, once the 'intended goal' had been inhibited and steered elsewhere.

The autonomy of beauty and its disinterested character in Kantian fashion – for Menninghaus Freud clearly borrowed his views on beauty from Kant, while Darwin based his ideas

on Burke and Hume – *switched* from reproductive success to the creation of a 'higher civilisation' (Menninghaus, *Wozu Kunst?* 74).

On the one hand, the Kantian view of beauty was based on an exorcism of sexuality and on an enhancement of regularity; on the other, the French and English views of beauty are inclined to enhance the 'physical' impact of beauty and to sustain that aesthetic values are activated by forcing privileged characteristics such as novelty, rarity, and exaggeration.

2. Beauty as activator of a 'narrative'

From the perspective of this article, which aims to understand how the original myth of mermaid-birds change into the adulterated and late myth of mermaid-fish, it must be underlined how the weapons of beauty, for Darwin and neo-Darwinists, are fundamental for insects and birds, while mammals appear very crude and base their existence on the *law of battle*: indeed, mammals often select their female partner, who has no choice in the matter, after a physical battle between two or more male contenders.

If humans start by excluding beauty from the instruments at their disposal and rely on their fighting skills, from the viewpoint of bio-culturism, it is true that the higher the civilisation, the more the courting techniques of men return to the ornithological art and the original value of beauty: singing is worth more than a simple noise; symmetry, rhythm and repetition are worth more than asymmetries (Mithen, *The Singing Neanderthals* 118).

This is proved by the fact that the nudity of skin is the first ornament of a human body compared to that of other mammals, in spite of the undeniable practical disadvantages (less thermal and bacterial protection).

The evolution of humans has been opposite to that of apes: the sexual organs of apes are hairless and have a large pelvis while in humans, whose skin is covered by much less hair, the erogenous area extends over the entire body, while the sexual organs are pelvic (Darwin 285-91).

According to Menninghaus, nudity is a highly improbable characteristic and thus an aesthetic value for men, as maintained (not by chance) in the classic ideals of beauty: bear skin, therefore, does not represent the lowest level of beauty, *au contraire*, it is a sort of 'clothing', selected over thousands of generations, which is equivalent but per *detractio* to the multicoloured plumage of birds (*Wozu Kunst?* 58).

True neo-Darwinists today point out that the ornaments on human bodies (*maquillage*, necklaces of shells or animal teeth, the use of ochre for painting the skin) appeared as early as 150,000 years ago, while the first figurative traces or the first decorative objects date back no further than 70,000 years. This leads to three conclusions.

(*i*) Beauty originally had a bio-sexual role.

(*ii*) Painting historically began with *maquillage* and not vice-versa.

(*iii*) Singing, rhythmic and melodic vocalisations are the first art form of human culture, and in this respect it should be noted that according to Darwin mammals do not revert to *singing*, but only to *calling*: chimpanzees have no vocal cords that would allow them to obtain the beautiful sounds produced by humans and birds (performances that are often genetically limited to male birds, who are obliged to attract females through sing). Song, therefore, is a sexual attraction and myth at the base of beauty.

The Origin or *omphalos* of all aesthetic aspects in dancing arts (such as the ritual dances of peacocks) and song (such as that of the male blackbird) reveals, among other things, a lack of distinction between the singer and the receiver, or at least an active participation of the receiver that only the digital aesthetics in recent years has succeeded in enhancing once more.

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If beauty has this huge importance for the evolution of all the species, it would be reasonable to assume that mankind has developed receptors that are able to decipher beauty with particular efficacy, and that there are neural regions that carry out this function alone.

This question was used as a basis by Semir Zeki, the founder of neuro-aesthetics, to conduct a series of experiments on the perception of both visual and musical beauty, in the certainty that the *significant form* of beauty has a *brain-based* nature.

In particular, Zeki envisaged the monitoring of cerebral activity in the observation phase of an artistic song – in other words, entirely invented – with the aim of verifying if a single part of the brain is appointed to make a synaesthetic assessment of beauty, or if different areas of the brain are activated when faced with different types of input (visual and musical) of something that is markedly beautiful.

In this sense, Zeki assumes the same theories expressed by Edmund Burke in his famous *Phylosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful*, in which aesthetic experience was identified in a sort of illusionist 'invention' of the senses of the subject concerned.

While Burke believes it is the receiver and not the creator who sees beauty in something, also Zeki believes there is only one area, or at least a single group of cerebral areas that are able to elaborate the various degrees of artistic beauty, conveyed by visual and acoustic codes.

In a specific test, Zeki assessed the cerebral activity of 21 subjects (average age 27.5, 9 males and 12 females, right-handed, with normal abilities of visual-acoustic perception and psychomotor abilities, from different multi-cultural groups), who were exposed to figurative and musical stimuli, in fMRI (Zeki and Ishizu).

In particular, 30 subjects were exposed, beforehand, to a test session aimed at making a selection from 60 images and 60 music tracks.

Each stimulus lasted 16 seconds, with an interval of 2 seconds between one and the next, and the test subject was asked to give points for each one, from 1 to 9 on the Likert scale: considering the evaluations 1-3 as 'unpleasant', 4-6 as 'indifferent', and 7-9 as 'nice', 10 examples were then chosen for each category for a total of 30 paintings and 30 pieces of music.

The sample of artistic items to which the 21 test subjects were exposed was then given by 60 total inputs, equally divided between the two senses used.

The test began by presenting the test subject with a flat screen with a central dot on a black background, for about 20 seconds; a sequence of stimuli was then proposed, each of which lasted 16 seconds and was separated from the next by an interval of one second; for the acoustic stimulus, the black screen had a luminous dot in the centre, which the subject was asked to stare at; at the end of each piece, they were given up to 5 seconds to evaluate the quality of what they had just seen or listened to using the keys to establish the degree on the Likert scale; after 60 stimuli, subdivided into 5 sessions of 12, the black screen reappeared for the final 5 seconds.

The results obtained showed a marked activation – in the case of acoustic or visual stimuli produced by regular, very well-known tests – of the area known by the acronym mOFC, Medial OrbitoFrontal Cortex. This is a restricted, specific area of the pre-frontal cortex, a larger area that can receive messages from the mediodorsal thalamic nucleus and is located in front of the motor and pre-motor cortex of the frontal lobe.

The pre-frontal cortex is subdivided into three micro-areas, one of which is in fact the medial orbitofrontal cortex, and includes a series of 'architectonic' areas, such as the Brodmann area, which has the task of processing visual, olfactory and somatosensory stimuli, and plays a major role in the elaboration of sensations of reward, gratification and pleasure, in addition to the formulation of an evaluation.

In the test, Zeki verified that the medial orbitofrontal cortex was the only area of the cortex able to take part in the cognitive system of all subjects, with both the artistic inputs presented,

which ultimately implies that not only beauty is governed by a single area of the brain, but that figurative and musical beauty coincide from a neural viewpoint.

Zeki also states that, on the one hand, the more one appreciates a song, the more intensely the mOFC is activated; on the other, he states that that the perception of ugliness produces an intense activity of the left and right amygdala, in the fusiform and lower occipital region, above all in the case of visual inputs.

In brief, if the correlation between the aesthetic experience of beauty and the activity of the medial orbitofrontal cortex is confirmed, it should be underlined, in particular, that the experience of neuro-aesthetic evaluation of both visual and musical stimuli is processed in the area A1 of the mOFC.

As Burke stated, it is the subject who *makes* something beautiful or ugly, and this is done in very different areas of the brain.

3. Exaggeration and beauty

Naturally, what might be considered a defect for Zeki is the very concept of beauty; he decides not to deal with this problem and in his tests he uses regular, well-established paintings and pieces of music: in other words, Mozart is beautiful because it's Mozart, Caravaggio is beautiful because it's Caravaggio.

This tautology is overcomed by the neuro-scientist of Indian origin, Ramachandran, who - in a chapter of his book *The Tell-Tale Brain* (Ramachandran 156-77) - theorises that art, and more in general the activity of aesthetic production, lead to certain permanent requisites, and that these requests meet the functional characteristics of the brain.

I cannot linger too long on this aspect of the essay of Ramachandran here, so it is sufficient to provide a concise list of the nine principles that our brain tends to consider beautiful: (1) *Grouping*; (2) *Peak shift*; (3) *Contrast* (4); *Isolation* (5); *Peekaboo* or 'perceptive problem solving' (6); *Abhorrence of coincidences*; (7) *Orderliness*; (8) *Symmetry*; (9) *Metaphor*.

Everything that helps us to identify something such as a figure against a backdrop (through the agglutination of the elements perceived and isolating them from a secondary context, for example through elements that are rarely present in nature, such as orderliness, symmetry, predictivity and contrast), or to give them a meaning by analogy to something else (as in the case of metaphors), is considered beautiful by us.

This confirms our expectations (in the case, the abhorrence of coincidences reigns supreme), this confirmation makes dopamine circulate and dopamine wraps its neuro-chemical warmth around us: we perceive beauty.

Naturally, Ramachandran does not forget or underestimate the importance of the role of individual cultures in the creation or enjoyment of art: the search for universal factors that can be connected with neural bases does not belittle the immense cultural richness represented by different styles, which are in turn determined by diversity.

In addition to this, the history of art or music do not coincide at all, according to Ramachandran, with the triumph of the Valkyries towards a model of absolute beauty. On the contrary: there is often a game of attack and defence, construction and deconstruction, a conservative and an avant-garde approach aimed exclusively at producing aesthetic diversity and perceptual differentiation, certainly not beauty.

To understand what the analysis of Ramachandran involves, I will deal with the second element only - *peak shift*, a phrase used by the Indian neuro-scientist to describe a process of amplification/re-dimensioning of distinctive features: the cognitive process that identifies something as being beautiful requires both the artist and the viewer to implicitly recognise certain salient characteristics of a form that can be represented, and the explicit creation of an exasperation or re-dimensioning of these characteristics.

This is what the brain likes - and not only the human brain, as demonstrated by many examples of visual observation in which the *peak shift* principle is applied, and a well-known test that assumes the prime susceptible aspect of *peak shifting* to be the aspect of shape, in particular where rectangularity is the main characteristic of an object being observed.

A very particular behavioural pattern was noticed in mice that has also been verified in other animal species: a mouse was presented with two visual elements, one square and one rectangle in shape; each time it headed towards the first element nothing happened, while it was rewarded with food when it headed towards the second.

After around a dozen attempts, the mouse learned that by choosing the rectangle it would be given food.

This is nothing new: it was the same mechanism of the famous Pavlovian dog.

What makes this test extremely interesting is following phase: the mouse was presented with the same rectangular object and another object, this time no longer square but even more rectangular (larger and with better defined corners).

One might have expected the mouse to continue heading towards the object that it had learned would give it cheese, but the mouse headed towards the second, because it recognised the salient property of the first object and saw this amplified in the second object. This caused an even greater interest in reaching a goal: once it had learned that 'rectangular' means 'I get food', the more rectangular an object, the better it will be.

To conclude, the *peak shift* made the more distinct triangle 'beautiful'.

The Nobel prize winner for biology, Nikolaas Tinbergen, has conducted experiments on royal seagulls since the Fifties. This species is widespread along the coasts of Great Britain and America and stands out from other species due to a small, round red dot on the long yellow beak of the female.

In consideration of the behaviour of the hungry chicks who pecked vigorously at the red dot on their mother's beak, Tinbergen asked himself how they could recognise her amongst many others.

A subsequent test provided an interesting reply: they did not recognise her at all, or rather the chicks of the royal seagull ask for food by relying on the recognition of an elongated object with a red dot: when they are presented with a false, inanimate beak with the same characteristic, they begin to behave in the same way as with their mother.

Moreover, the visual mechanism of the seagulls is certainly not highly sophisticated and many other factors might lead the chick to get mixed up. Its vision has, however, evolved over thousands of years, following an energy-saving principle for the sake of survival, so a minor detail is sufficient for it to recognise an element in its surroundings.

There is yet an even more interesting factor, which unites the case of the seagull of Tinbergen with the aforementioned experiments on the mice.

By manipulating the conditions and presenting the chick with a false beak with red stripes at the end, it was noticed that the chick looked for it even more intensely, pecking more vigorously.

The second rectangle was perceived by the mouse as a 'super-rectangle' and the second beak was perceived by the seagull chick as a 'super-beak'. All this took place using a well-known object with amplified aesthetic properties.

Naturally, caricatures are an evident form of exasperation in terms of peak shift but it is not the only way of making reality pleasing the eye.

As an example, Ramachandran takes a statue of the Indian goddess Parvati: her accentuated breasts and hips might make her a sort of sexy pin-up, but on the contrary, the *peak shift* principle applied to the goddess Parvati is very sophisticated and involves two different reconfigurations compared to the usual reality: the first regards an amplification of the anatomic proportions; the second regards the amplification of the possible postures.

It is thanks to these two aspects that Parvati is able to embody the concept of femininity in a form of beauty.

She is able to do this both through a hyperbolic exaggeration of typical traits of a woman (hips and breasts), and through a reduction - equally hyperbolic - of the volume of attributes that are more developed in males (the abdomen is tiny, for example).

While the sculptor adds feminine elements and reduces any that are potential masculine, the postural *peak shift* is also a key aspect: many statues represent this in absolutely unnatural twisted positions that are virtually impossible to assume.

Also in this case, beauty is seen from the viewpoint of the brain.

Does this mean that *peak shift* is an 'ultra-stimulus'? Does beauty coincide with perceptual knowledge? Ramachandran maintains that certain trends in painting implemented *peak shift* principles, such as cubism, which successfully used the same mechanism triggered by the three red strips in the perception of the seagull chicks.

In their respective areas of painting and sculpture, Picasso and Henry Moore were able to link their work deeply with the 'figurative principles' of our neuro-perceptive grammar: abstract art is in fact made up of ultra-stimuli, which excite the neurons of the visual areas with great intensity, compared to realistic images.

4. A neural activator: our habitat

Does the brain behave in an autistic fashion, giving us visual orders regardless of everything, as Ramachandran seems to maintain? John Onians, a scholar of E.H. Gombrich, together with Michael Baxandall and the founder of *neuro-arthistory* – a clearly bio-culturist discipline (Onians) – mitigated Ramachandran's scientism and brought about a return to the idea that our visual thoughts are conditioned by our past and surroundings, even within a scientific community, which recognises a qualitative leap in the *neuro-imaging* procedures, which is today unavoidable.

Onians' studies were based on a theory known as *period eye*, in other words the idea that the intensity, and above all the frequency, with which we and above all artists look at something that distinguishes their natural habitat, brings about neural changes in relation to our visual and stylistic preferences.

To explain this assumption, the American historian analyses a series of 'breakthroughs' in the history of art, from the Palaeolithic to contemporary art, and he does so by relying on a series of neuro-scientific characteristics, in particular neural plasticity, the cerebral rewarding system, the so-called 'intrinsic functional connectivity', the sectorisation of the visual system, the mirror neurons, the influence of contextual factors and the neural genesis of the imagination (Leahy 284).

Specifically:

(*i*) 'Neural plasticity' is that cerebral function that allows innate resources to be strengthened or weakened, through individual experience, depending on the intensity and frequency with which they are used, as well as the formation of new connections.

Onians exemplifies this assertion by citing an experiment involving the fMRI brain scan of an artist compared with the same scan of a non-artist whilst drawing: the scan revealed a greater cerebral activity in the visual field of the non-artist, evidently because the visual cortex of the latter 'forces itself' to find elements on which to base the drawing, while in the artist, it is able to elaborate the information perceived in real time, sending it to areas of the brain that had already been involved in similar tasks.

(*ii*) The 'rewarding system' is also of fundamental importance and is connected with the release of dopamine, a chemical mediator involved in the establishment of memories (thanks to the hippocampus) and of motor memory: In fact, while the original function of the brain is that of guaranteeing the survival of an individual, it appears natural for it to 'reward us' when

we succeed in completing a voluntary action or consolidating connections that trigger this ability.

The same process of gratification is also activated when we are able to produce an image (artistic or not), and when we enjoy the result, pushing the artist to create – and the spectator to desire – works of art that correspond to their most accentuated connections.

(*iii*) The *rewarding system* interacts with the 'intrinsic functional connectivity', the neural network that is active when a person is sleeping or inactive, linked with the episodic memory of each individual or their cultural context: it is in fact this connectivity, which is innate in all human beings, that determines not only the pre-established way in which the brain 'produces' reality, but the universal spreading of anthropomorphism and of the trend to draw close to natural and artificial phenomena as if they shared certain properties with mankind.

(*iv*) Nevertheless, in this process of neural 'abracadabra', the most crucial role is that of the 'visual system', considered the main sensory channel for the construction or change of neural connections involved in our understanding of the world.

Indeed: Onians maintains that the act of repeatedly or intensely observing certain properties of objects in a certain space or time, strengthens both intrinsic cerebral resources and those that have been acquired.

This means that

(*v*) The 'contextual factors' transmitted to the brain through constant sensorial inputs are fundamental for the modulation of the neural connections: for Onians, the eye is the priority channel of our surroundings and of a set period of history, and indeed he refers to this with the term *period Eye* (Onians 24 ff.).

With this approach of applying the neuro-logical characteristics to analysis of art, Onians tries to illustrate the mental and visual 'tools' that we use during the production and/or enjoyment of the works of art in a particular place and time.

The visual *incomes* arrive down two main pathways: the lower (ventral), pathway, directed at the temporal lobes of both hemispheres deals with the localisation of objects and it is therefore called *what pathway;* the upper (dorsal) pathway, which leads towards the parietal lobs, deals with the identification of objects in space and the actions linked to them. For this reason, it is called the *how or where pathway* (Onians 220 ff.).

While the first pathway laps the areas of hearing in the temporal lobes, integrating the information perceived by the ear with that of the eye, the second pathway laps the somatosensory and motor areas in the parietal lobs; both give rise to distinct areas that have the task of the visual recognition of objects from birth, representing the salient features of complex objects, and relying on the sensory memory to identify such objects (Hayn-Leichsenring, Lehmann, Redies 19 ff.).

These areas confirm that not all cognitive categories are formed socially, but some are of organic origin and are activated during an unconscious process of recognition based on the sensory data that are already stored in the phylogenesis.

Last not least: for Onians it is important that the perception of movement involves the *how or where pathway,* the one that also contains the mirror neurons, so the mirror system does not only make us simulate the world around us but allows us to empathise with it, attributing mental statuses to ourselves and others: these are the cerebral functions that give rise to spontaneous behaviour patterns that are strongly influenced by internal and external factors that can determine, through a prolonged visual exposure to a particular shape, the aesthetic preferences of the artist, the client and the observer.

One of the examples analysed Onians to demonstrate how the recurring perception of salient images affects the artistic style is that of the cave drawings from the Upper Palaeolithic in the cave of Chauvet – paintings that he defines as true *neuro-graphics*, in other words recordings and reproductions, in images, of neural activity.

The most evident case of neuro-graphics is the drawing depicting a bear, on a point of the rock face that simulates the belly of the animal three-dimensionally: in this case, the visual memory is evidently activated by the shape of the crack in the rock, isomorphic to a bear of which only three quarters are visible, so the matter of the rock triggers an unconscious recognition (based only on sensorial memories) that 'matches' the mnemonic *stores* of the mind. In fact, it is the similarity between the image conjured up mentally and that perceived visually that triggers the *rewarding system*, and the greater the similarity between the two images, the greater is the reward.

In artistic terms, this means that the closer a drawing comes to the real image of the subject we conserve in our brain, the more it will be liked – otherwise this extraordinary realistic choice in the drawings of Chauvet, dating back to the Upper Palaeolithic could not be explained (Brown et al. 255).

What we are observing, according to Onians, is a spontaneous process based on key elements of the neural system, in which the motor resources that control the hand of the person drawing are linked with the perceptive resources that manage the vision through electro-chemical inputs leading to the accomplishment of a goal (*rewarding system*) (Onians 98) and to the release of dopamine.

However, the pleasure of an image soon becomes the pleasure of repetition, so the more an image is repeated and the more the image is exaggerated and becomes unnatural, activating the neural process of the *peak shift* of which Ramachandran speaks, or the exasperation of the essential elements of the figure (the horse's face) to increase the gratifying effect.

This process is a stylistic rule also for Onians, the one from which mannerisms are generated in every period in the history of art: the repetition of an image leads to a repetition of the vision that solidifies not only the neural connections involved in the motor (executive) deed, but above all those assigned the task of conserving and re-proposing the figurative result.

The stronger the neural connections with the image of the shape painted, the looser the neural links with the real form become, with a change from figurative to plastic imagery with which researchers of visual brand identity are only too familiar (the apple of the Apple company being the most famous), as they are used to a progressive reduction of the naturalness of the brand depending on how positively it is positioned on the market.

5. Conclusions

How do things work in the link between the beauty and the storytelling? As largely evidenced, the beauty neural receptors are housed in the brain's most archaic region confirming the crucial role of the aesthetic pleasure in the animal and human bio-evolution since the very origins and its obvious trace in the narrative constructions of every age. There is no need to return to the seriously concerned and founding for the Odyssey's causal chain Homeric *topos* of the Helen's abduction – the most beautiful woman in the world, daughter of Ocean and Aphrodite – to understand beauty's role of a thematic activator within most of the archaic and folkloric narratives. A glimpse of the fairy tales, the most archaic available narrative relics, is enough: the prickly beauty of the Prince on the ship's deck seen by Andersen's little mermaid; the very myth of the mermaid, the bird-women or just fish-women in Syria from the seventh century AC, that fascinate those who watch / listen to them; mostly the tale of the Raven by Giambattista Basile (*Lo cunto de li cunti* IV, 9), which narrates how the Frattombrosa king Milluccio discovers in the wood, during a hunting trip, a beautiful white marble stone splashed by the red blood of a black crow.

This vision generates the desire in the king to have a wife white and red like stone, with hair and eyes as black as the crow. His desire, so strong to almost sickening, forces his younger

brother on a search for a bride who has those three colors. The image is perturbing and primary. From the same beginning the beauty binds to the expectations of a sexual relationship importantly resorting to the peak shift principle: the caricatured trichromacy not casually will also be found in the Grimm's *Schneewittchen* (Snow White). There the queen remains pregnant by autogenesis while observing the white snow, falling through a black ebony window, and distractedly pricking her finger making the red blood drops. The only certainty here is that the libido of Milluccio and Snow White's mother are closely related to the simultaneous perception of the three colors.

What happens then? The beauty, acting as a storytelling propeller, is literal: forms, not meanings. In these tales in fact, the colors don't stand side by side with objects or constitute their simple attribute, but they establish them. The colors are the objects of the discourse in the same way in which from them radiates a magical process of mutual assimilation (effectively, of isomorphism: when everything resembles itself and everything becomes identical) between the witness of and the elements in the magic scene: accordingly the king of the Raven risks becoming a stone himself while staring the two colors streaked white stone as for the magical process of falling in love with the statues that urged some scholar to read The Raven as one of the many «agalmatophilia» evidences (Conrieri 169 ff.). Reconsidering the semiotic distinction between figurative (iconic signs of things existing in reality) and plastic (the primary components of the language of images, i.e. lines, colors, space arrangement) elements, one notices that the first ones are missing in the Raven (Palmer et al.; Brachmann and Redies 15). The crow lying on white stone, stained with his blood, marginalizes the high iconicity figurative traits, because at stake is not a bird but a colour triad. The color triad indeed pushes the text origin back to archaic times, when the narrative was still encapsulated in a-narrative strings, essentially consisting of descriptive visions with a missing plot, namely someone who would do something in anticipation of a goal to reach. Only from the classical civilization on, the storytelling, through the peak shift and in the different modulations given by the so-called period eye, begins to encapsulate the beauty in narrative strings that retain its, as they are, Darwinian origin. Solely from that moment the last will keep its absolutist positions in the narrative fictions of the whole world.

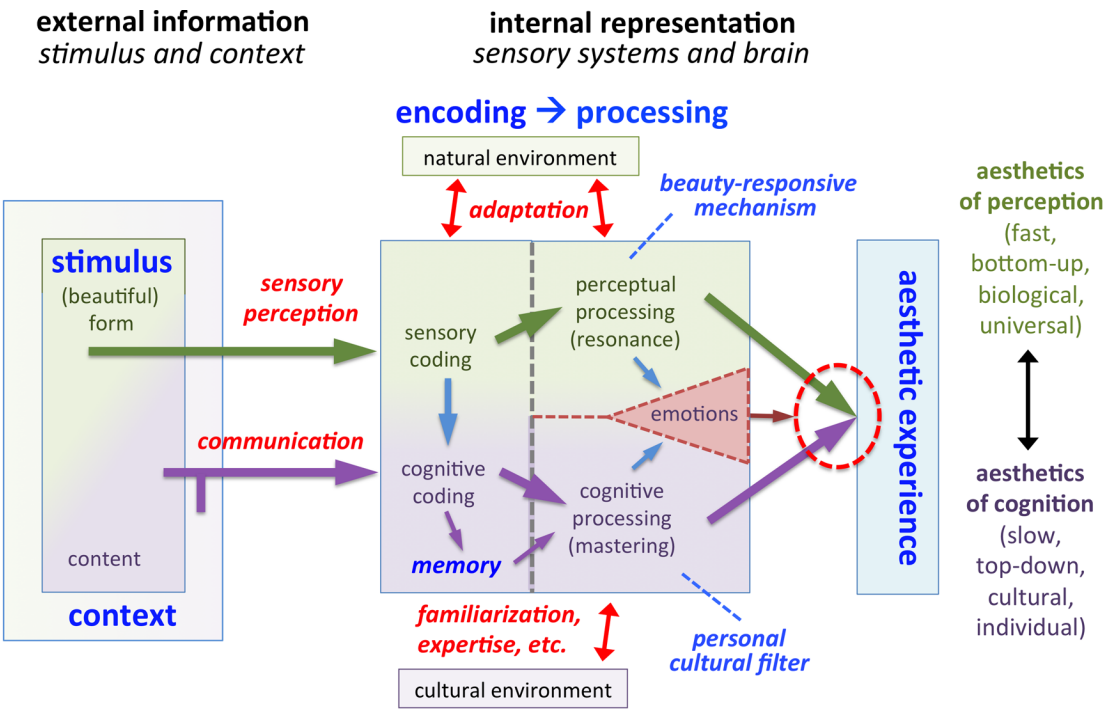

Fig. 1. The model of the aesthetic perception proposed by C. Redies.

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