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Journal of Dermatology & Cosmetology

Review Article

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The multifaceted human facial appearance: beyond skin and hair

Abstract

The present paper aims at analyzing how–and to which extent–the subjective concept of "Beauty", through the facial appearance of humans, can be scientifically studied and objectively defined. The major criteria that affect the appearance of facial skin and hair are reviewed with a special mention to their individual, psychological, social and ethnic impacts. The underlying and silent biological events that govern facial appearance are described at the light of the most recent findings. The constant dialog established between skin and brain, in addition to its sensorial aspect, owns a particular importance in driving strong individual and social relationships and in governing attractiveness. All these exposed criteria allow the respective roles, impacts and duties of the two complementary branches that both aim at modifying facial appearance, i.e. Dermatology and Cosmetics, to be better described. Through the so subjective concept of "beauty", the present review attempts to illustrate the permanent and strong connection between the inseparable physiological and psychological facets. The good maintenance of their respective balances is the core definition of health, as stated by the World Health Organization.

Keywords: facial appearance, cosmetics, genetic analysis, skin physiology, human diversity

Volume 2 Issue 2 - 2018

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Received: March 19, 2018 | **Published:** April 13, 2018

Introduction: Beauty, a scientific challenge?

"Appearance rules the world". Friedrich Schiller (1759–1805).

The question of beauty reality and truth was raised by the Journal "*Nature*" in a few articles (Supplements in vol. 526, October 2015). It indeed may well surprise laymen, as mathematicians, physicists, astronomers, biologists, geneticists…are commonly perceived as gatekeepers of objectivity and accuracy. As the latter terms hardly apply to beauty, attempting to give it a clear–cut definition, under authoritative statements, comes utopic for many reasons.

Even if beauty is real and influent, its definition remains puzzling. At first, the very term beauty applies in common conversations to a wide range of very different elements (a human face, a baby, a landscape, and an animal, a vegetal...). Second, its roots are much anchored within ethnic cultures, history, fashions…and its perception is thought dictated by a central region of the brain (amygdala), i.e. the epicentre of "aesthetic brains".[1] In brief, the perception of beauty, anchored within the human conscience, undoubtedly strives emotions.

However, beauty may own an objective part, according to physicist D Deutsch[2] who takes the beauty of flowers as his favourite example: these are attractive to insects (the objective part/pollination) and humans (their subjective part) through shape, colour, and fragrances.[2] The standards of this beauty objective part are subjected to permanent improvements, like in science. The "beautiful" Newton theory was a first standard that was further enclosed and enlarged by another "beautiful" Einstein theory, like two successive Russian dolls. In both cases of beauty and science, standards' improvements tend to reach an objective truth.

These appealing papers indeed share a common aspect: scientists are confirmed, contrarily to a common preconceived idea, as sensitive to beauty as any human being. One can possibly state that scientists might even be more sensitive to beauty since they often assimilate it to truth, the "beautiful" grail: "*The pursuit of truth and beauty is a sphere of activity in which we are permitted to remain children all our lives" (*Albert Einstein). This prestigious master could have hardly been more concise.

Taking these excellent articles as common thread, we modestly attempt here to focus on some important features owned by the human facial appearance, as part of the so complex concept of "beauty". The very word "appearance" clearly prevails in scientific papers. Since about 40years, more than 9,400publications have dealt with facial appearance, all domains included. A same query, using "beauty" as key word, only leads to less than a dozen of exploitable documents.

As chief actors of aesthetical aspects, the characteristics of skin and hair are logically first described by the objective criteria. Nowadays, a vast arsenal of new investigating tools offers improved visions of both diseased and normal/healthy skins and hairs. However, as epidermis, neurons and melanocytes derive in common from the ectoderm at the neurula stage embryologic development, the human brain unsurprisingly dialogs with this tissue, making facial appearance a permanent interface between the "seen" and the "felt". Since about two decades, the subjective impacts of skin–or hair–upon aesthetical, psychological, social domains have received an increasing attention, showing how appearance, like an iceberg, owns two inseparable faces, much justifying the Paul Valery's statement wherein *"Skin is the most profound part of humans"*. The various elements of this complex duality are the foci of the following lines. In this short assay, we will successively address the visible face of facial appearance, its hidden face and its modifications.

The visible face of facial appearance

In the scientific domain, observation precedes and conditions the understanding. The early times of science (Aristotle, Pline, Linné, Buffon, Darwin.) grounded observation and objective description as

pre–requisites. These *imperata* obviously required the contribution of talented designers and painters. By perfectly imaging the shape, size, colours of many living species, their *magnum opus* became precious data basis offered to the following generations. The remarkable drawings of the human anatomy by L. Da Vinci and A. Vesalius in the 16th century indeed grounded medicine or surgery. The 20th century revolutionised the observation phase through the burst of sophisticated medical imaging techniques (X–rays, MRI scanning, ultrasound A and B modes...). Digital pictures and image analysis, intensely improved and processed by powerful soft–wares, offered new, neutral and standardized visions of both healthy and diseased conditions. In short, these techniques rapidly became precious helps in both diagnosis and treatments. They were logically extended to many diverse scientific fields, i.e. genetics, histology, ethnology, animal and vegetal biology, ethology, forensic science, up to police investigations.[3–10] The facial appearance cannot be defined by single features, as it integrates a number of various physical traits (shapes of nose, lips, eyes. skin colour, presence of hairs, wrinkles etc..) that strongly drive individual and social recognitions. In that sense, as an integrative dimension, appearance is probably better defined by a multi–parametric equation.

An ancestral but still vivid human concern

The concern of facial appearance is certainly as old as humanity. Prehistoric sculptures, Egyptian make–ups, face powders in the 17th–18th century in Europe associated with extravagant wigs…all witness of a deep and multi–secular human worry. Religious rules make no exception: a recent book (*Beautés Sacrées, F. Aghassian, Editions du Cerf, Paris,* 2016) remarkably illustrates how the Bible, the Koran and the Torah share and recommend some similar "beauty recipes". In common to these three sacred texts, caring one self's image is paying tribute to God. The permanent quest of a better facial appearance obviously grounds on many other admixed factors i.e. psychological, social, cultural, ethnic, fashion–related, and chronological through a dictatorial aging process. The paramount desire for a paler skin tone in Asia is more a social criterion than a mere obedience to aesthetical or ethnical desires: a darker skin signs out–door workers, i.e. "low–class" people.[11–13] Worldwide, wrinkles, pigmented spots, acne, scars, dark circles, dyschromia, rosacea, alopecia, port wine stain, vitiligo… are viewed as individual and psycho–social signals of an altered, tainted facial appearance as concisely summarized by Prof. AM Kligman, "*The book is judged at its cover*".

Facial Appearance and human diversity

A common *homo sapiens* genome, differently expressed under polymorphism and epigenetic controls, creates a large mosaic of facial traits, worldwide. Today, the sequencing of the whole genome makes it possible to partially predict human physical traits.[14] Skin or hair colour, shapes of hair, eyes or nose is evident signatures of a membership of a given ethnic human group or its past crossbreeds. For example, recent genetic evidence indicates that the light pigmentation variant at *SLC24A5* was introduced into East Africa by gene flow from non–Africans.[15]

These phenotypic features were unfortunately perverted for "scientifically" vindicating an intolerable discriminating racist theory according to which some "human races" were superior to others, the cruel source of slavery, apartheids and genocides. Despite, the very word "race" and its derivatives ("racial"), are still inappropriately used by some papers or legislations that disregard scientific evidences.[16–18]

Beyond skin and hair, the diversity of human populations includes social, cultural aspects religious codes, fashions and individual lifestyle that impose, in some cases, the face to being hidden to the other's vision. Social/cultural and lifestyle habits create, among all ethnics, another mosaic of altered facial traits with regard to skin colour (sun–hiders vs. sun–seekers, skin whitening, tanning) or hair shape (straightening, waving, curling…), up to a bald–headed or bearded appearance as marker of religion or sect. This palette of external interventions (including lip volume and eye shape), is superimposed to innate aspects and amplified by the growing demand of cosmetic/plastic surgery, worldwide, even in young subjects.[19–21] as reviewed by S Gupta.[22] The facial appearance is influenced by a number of major factors with various individual and social consequences (Figure1). The human body makes no exception: as reviewed by KR Chi,[23] although women seem more sensitive to body image than men, the latter show nowadays a clear trend in adopting such preoccupation. Back to the past? In prehistoric periods, the various factors of men appearance–size, muscular strength, posture, adornments (necklaces…) were likely driving factors in arousing or imposing group domination. In more recent times (Egyptian dynasties), the burst in the feminine desire of making–up, coupled to elegant dressings brought new aesthetical principles that are still vivid.

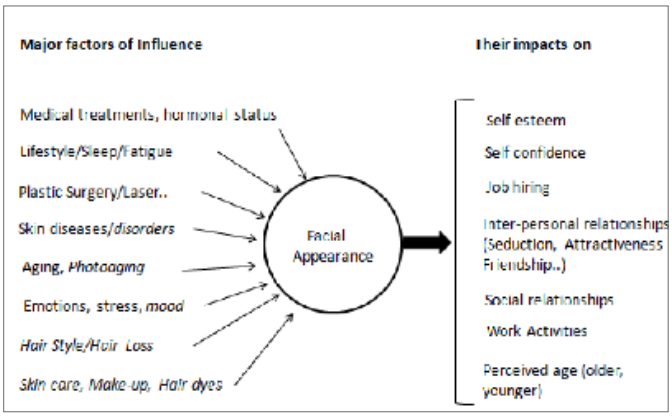

Figure 1 Appearance, an integrating dimension. Summary of the major factors known for impacting facial appearance and their individual and social consequences. In bold italic: Territories of direct cosmetic interventions.

The hidden faces of facial appearance

With regard to the biological aspects of skin and hair follicle, the previous iceberg comparison remains valid. The "backstage" of skin and hair comprises important actors: different cell types (keratinocytes, melanocytes, Langerhans cells, fibroblasts...), active or dormant genes, messengers of all kinds (steroid hormones, eicosanoids, interleukins, cytokines, chemokines, growth factors, neuro–transmitters etc..) that, in final, set up the visible/phenotypic criteria. On such invisible stage, the genome and its expression obviously play the main roles within the evolutionary epic of humans (genetic exchanges, crossbreeding). The example of the skin colour is particularly illustrative since closely linked to the evolutionary stage of humans.[24–28] Migrations of modern humans from eastern/central Africa to northern regions (Europe, Asia, and America) along large periods of time (≈ 60,000–30,000 years ago) certainly played a major role in the adaptation/modulation of the skin colour and its adaptation to UV rays.[27] New climates, different

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UV radiances, different food resources…likely favoured some DNA mutations (MC1R and SLC24A5 genes as examples) to being selected and expressed, that progressively lightened the human skin of these migrated populations, thus sustaining UV dependent Vitamin D production.[28] Although some mutations seem of a more recent onset (6000–4500years ago)[29] the eumelanin (brown dark) pigment still largely predominates within the skin and hair of humans.[30–32] A recent work[33] showed that, irrespective of the constitutive skin colour, human epidermal melanocytes synthesize both pigments (eumelanin and pheomelanin, yellow to red) at a same ratio (76% and 24% respectively). According to skin photo types I to VI (from pale to very dark tones) increasing amount of both melanin's are delivered to constantly multiplying epidermal keratinocytes. A recent landmark paper[34] shows that variants of the MC1R gene are significantly associated, in Caucasian subjects, with perceived age (younger/older), thereby setting up a genetic basis on facial appearance, irrespective of individual skin colour. To summarize, according to the authors, "*individuals carrying the homozygote MC1R risk haplotype looked on average 2 years older than non–carriers*". Nevertheless, considering the vast gene admixing directly linked to today's travel facilities and individuals' relocation, one might predict that MC1R loss of function (linked to red hair) will progressively fade out, while new phenotypes and facial appearances might emerge.

Unseen–but crucial–actors on the skin stage

The hidden face of skin integrates, as a composite tissue, the expression of genes of all its cell types and ensures their constant inter–cellular communications. A recent work[35] showed that dermal fibroblasts play a major role in modulating the synthesis of melanins by epidermal melanocytes, i.e. tanning of the skin. Hidden to us, skin acts as a permanent immune sentinel: the constant dialog between keratinocytes and Langerhans Cells (LC) affords an efficient and permanent immune alert to T and B lymphocytes. LC are migrating antigen–presenting cells, prone at reaching lymph nodes and at inducing the multiplication of competent lymphocytes.[36] Invisible, a microbial world (bacteria, yeasts) permanently thrives onto the skin surface and within the hair follicle.[37] The qualitative and quantitative composition of this rather stable flora much varies with the various biotopes of skin sites (dryness, sweat, sebum…) and its complex metabolism permanently interacts with the skin physiology.[38]

These are a few examples that indicate how the hidden face of skin constantly confronts and adapts to internal and external stimuli that are now commonly covered by the generic "Exposome".[39] These permanently concealed activities have been, this last decade, the privileged focus of the "Omic" sphere (Genomic, Transcriptomic, Metabolomic, Proteomic, Microbiomic..), thanks to highly sophisticated investigating tools, genetic–based,[40–43] as outlined by A Katsnetson.[44]

A constant brain–skin dialog, fast reacting through subtle mechanisms

The reaction of skin (or brain) to external assaults can be extremely fast, thanks to its highly developed sensitive network of nerve fibers, corpuscles (Pacini's, Ruffini's) and cells (Merkel cells). The painful contact of skin with a nettle is immediately felt and some people may flush and blush within a second, in reaction to a provocative event, transmitted by small molecular messengers acting on the peripheral blood vessels, such as Nitrogen Oxide (NO). By sensing the environment,[45] skin then intervenes as both endocrine and neuro–immunological organ.[45–47]

On this same sensorial/intimate aspect, some cosmetic or hygiene habits bring impacts that are subtle and fast: how can a mundane shower rapidly induce a feeling of a better "well–being" to almost all of us? An unconscious remembrance of our first months within amniotic fluid? By which mechanisms? What drives the immediate hedonic or repulsive smell of an odor that may arouse or inhibit feelings? How a basic making–up can rapidly increase the production of IgA in saliva.[48] These questions even apply to hair: hairdressing or hair dying rapidly and positively affect the psychological mood of women.[49] Under a more integrative way, one may predict that the use of cosmetics, by ameliorating self–confidence, could help fighting anorexia[50] or mitigate the walking difficulties in aged people.[51]

The two–faced facial appearance

Like the two–faced Latin God Janus, the facial appearance presents duality (Figure 2). On a one hand, skin and hair emit a set of various signals (ethnic origin, age, fatigue, emotions, skin disorder or disease, skin pigmentation, hair shape/colour/loss etc...) towards the neighbouring environment, e.g. "the other's vision". On a second hand, facial appearance induces various and intimate psychological consequences to its "owner", driving positive or negative self–appraisals, i.e. different status of self–esteem and/or self–confidence. The latter, in turn, strongly influence social or personal behaviour and attitude in life (mood, optimism vs. pessimism…). Dermatologists are daily confronted with such duality as many skin diseases fuel serious psychological disorders, depression included. In brief, the facial appearance strongly influences the psychological and psychosocial aspects involved in human affairs.

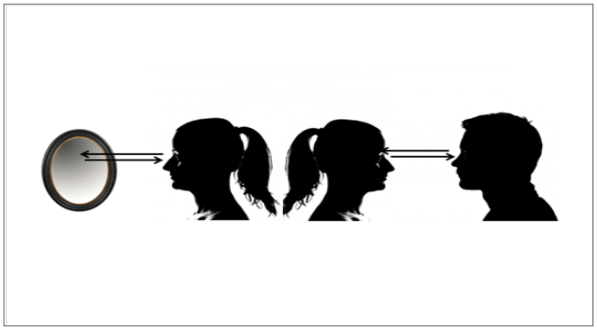

Figure 2 The duality of facial appearance: mirror and antenna.

An innate or modified facial appearance of strong psychological impact

Chronological aging is an unavoidable skin–altering factor (Figure1). It is likely amplified by lifestyle factors such as smoking, alcohol consumption, drug–addiction, sleeping issues, possibly added to sun–exposures that induce a photo–aging process (premature wrinkling, darks spots…). Some recent works indicate that exposure to aerial pollutants negatively impacts the epidermal and dermal physiologies, mostly through oxidative pathways.[52–55] Irrespective with causal factors, alterations in facial appearance deeply impact the psychological balance of a subject and the perception of his/her age by others, i.e. judged older or younger.[56–58] Severe acne, alopecia, vitiligo… are prone at inducing anxiety or depression.[59,60] With regard to innate facial appearance, many people feel dissatisfied with the

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shape appearance of their nose, eyes, lips or hair, explaining why many undergo plastic/cosmetic surgery.[61] Whereas a tainted facial appearance often induces a loss of self–esteem or self–confidence,[62,63] its improved status leads to the recovery of better mind–sets (see below),[64] i.e. the self–appraisal of a better health condition (The "Look good– Feel good" motto).

Facial appearance drives attractiveness

This aspect was superbly summarized by A Maxmen.[65] Attractiveness is a strong driver of evolutionary/genetic selection by favouring (or not) inter–personal relations through complex rationales. Attractiveness obviously affects animal/animal and insects/plant relationships.[66–69] The beautifully coloured and extravagant sets of some animals (fishes, birds...) long–time intrigued Charles Darwin. While most animals harbour camouflaging sets, some others exhibit provocative colours or shapes that would obviously make them easier preys. However, such beautiful appearances may play, among these animals, a strong role in their sexual behaviour and ultimately, in gene selection. As suggested by A Maxmen,[65] vivid colours likely play a stronger role than shapes in the sexual attraction/gene selection, red in particular, assimilated to a "youthful glow". This theme led the evolutionary biologist M. Cummings–quoted in[65] to express that "*this is no accident that cosmetic companies sell pink rouge and red lipsticks, rather than blue"*.

Apart from its obvious role in mating, attractiveness owns heavy human social consequences: job hiring, work relationships, friendship... are deeply influenced by physical attractiveness,[70–73] making skin logically coined as a "social organizer".[74]

A modified facial appearance

Skin and hair appearances: the basis of dermatology

As said above, science was initially descriptive and Dermatology (or dermatological research) made no exception. From the Greek and Arabian medicines, modern dermatology (Malpighi, Plenk, Lorry, Willan, Unna...) later classified skin diseases through clinical descriptions. Presence of squamae, exudation, skin colour, relief, locations and shapes of lesions etc... oriented the classifications of skin/hair diseases. These were artistically illustrated by Fournier and Lallier in 1889 that collected some 4,000 dermatological plaster casts, exposed in the museum (open to visits) of the Saint Louis Hospital, in Paris (www.hopital–saintlouis.aphp.fr). However, the terminology of these classifications brought some unavoidable confusions led by clinical overlaps (psoriasis/seborrheic dermatitis, dandruff) and used some fuzzy generics such as "eczema" or "prurigo". Today, dermatological research has successfully added a large arsenal of techniques/instruments (see below) that much complete or support clinical observations.[75–78] Importantly, these sets of complementary records are strongly reinforced by powerful histological/immunological techniques, viewed as "judges of peace", although obtaining human skin biopsies remains a serious ethical issue in many cases.

The tasks of dermatological research are anything but easy. Skin or hair diseases may either originate from intrinsic (epidermal, dermal, follicular) disturbances, systemic diseases (mental included), extrinsic physical causes (UV, dryness, pollution, etc…) or from biological invaders (bacteria, fungi, viruses, parasites, etc…). Research on AIDS was stirred–up by the sudden burst in the prevalence of the Kaposi syndrome. Bacterial or viral infestations (venereal diseases, leprosy, scarlet fever, measles, labial herpes, Papilloma viruses…) are known, since long, for strongly impacting the skin appearance. Mental stresses, of a very difficult experimental approach, are prone at initiating or exacerbating hair or skin problems (alopecia areata, psoriasis, acne…). The follow–up of treatments, topical or oral, logically implied to standardize the clinical observations of skin or hair appearance (PASI score, Leeds Acne Grading, Ludwig or Hamilton alopecia types etc..).[79–81] These shared scoring systems undoubtedly brought an immense help to dermatological researchers. Appearance rules again: Dermatology is, within medical fields, a branch where the patient can "see" and self–attests on the benefit or failure of a given ailment, despite her/his less accurate comprehensive knowledge. The mental changes observed in a patient, induced by a treatment, now become an intrinsic part of its global efficacy, through the filling of specialized questionnaires related to Quality of Life (QOL) or Well–Being,[82,83] as previously mentioned. In short, such assessments (physiological and psychological) now totally fulfil the definition of health by the World Health Organization that integrates physical and mental balances.

In routine, dermatologists face another duality with regard to skin or hair appearance(s): a significant part of their daily tasks deals with skin or hair disorders that never threat the human health. If no one dies from severe acne, the disfiguring appearance it creates, at a rather challenging emotional period (adolescence), may lead to serious psychological disturbs.[84–86] The demands from their patients often concern facial appearance and call for aesthetical/correcting actions (peelings, comedone's extraction, Alopecia/Hair transplants…), more than genuine health–related issues. A brilliant worldwide survey on Medical Doctors[87] showed that the 20 first items ranked as "non–diseases" were strictly linked to facial appearance (wrinkles, pimples, hair loss, greasy skin, aging, dark spots etc...).

The facial appearance: the "raison d'être" of cosmetic research

As mentioned above, adorning the human face by mineral pigments (ochre) is as old as the Palaeolithic period (30,000–12,000 years ago) even though it probably did not initially respond to aesthetical needs. Tribe memberships, facial signatures of a common hunting/harvesting territory, rituals, were likely paramount. Later, the Egyptian dynasties much developed the techniques of making up for magnifying[88] some facial traits, as outlined by C Wald.[1] These adorning procedures made the transformed subject (e.g. Queens Nefertiti and Cleopatra..) not only beautiful but psycho–socially perceived as smart, wise and naturally superior to their subjects. In short, make up is very likely the true ancestor of cosmetic practices for reasons that encompass the sole physical traits.

Nowadays, cosmetic products own a much wider range of different applications. Of note, most (≅60%, according to 2015 global beauty industry market shares by categories) of marketed cosmetic products are dedicated to face (skin care, make up, sun–protective, anti–wrinkles, foundations, lipsticks…) and head hair (hair dyes, anti–hair loss, hair dyes, hair conditioners...). These numerous products reflect the paramount importance of facial appearance. Since 4 to 5 decades, cosmetic research has dedicated considerable efforts for: i) better understanding the normal skin and hair physiologies by creating objective and non–invasive or in vitro tools (reconstructed skin

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models, hair growth *in vitro*), methods or reference visual scales, ii) protecting/preserving the skin from external assaults (UV's, dryness, pollution,…) or internal challenges (pimples, dark circles, wrinkles), iii) camouflaging some imperfections or alleviating an aesthetical or discomfort feeling (dark spots, hair graying or hair loss, dry skin, dry lips, sun–burn..) and iv) developing safe and efficient cleansing or hygienic skin and hair products that strongly impact the appearance of a head of hair, an important facet of all facial attributes that can be rapidly modified (perming, dying, styling..).

As mentioned before, a large number of non–invasive methods and research tools have been developed by cosmetic and dermatological researchers for 40years, dealing with skin mechanical or optical properties or imaging (Ultrasound, Magnetic Resonance Imaging, multi–photon, Raman and confocal microscopy, Optical Coherence Tomography etc..). These greatly enlarged the vision of skin structures (at cellular and sub–cellular levels) or functions. These objective measurements logically complete the follow–ups of some medical therapies. Same comments concern clinical/visual assessments, where standardized Atlases of aging facial skin now afford grading references among ethnics.[89–91] Some sophisticated imaging equipment's allow the facial skin color (or zooming on smaller regions of interest such as dark spots/lentigines) to being recorded and quantified.[92,93]

These scientific and technical advances nevertheless face a difficult challenge. At first, a normal healthy skin (free from any recurrent disease), shows subtle and slow changes (e.g. aging) that need months or years for being precisely followed–up.[94,95] Moreover, the facial appearance could slightly and rapidly be modified by spatial position, i.e. supine vs. upright[96] or emotions.[97] Wrinkles, skin pores are skin surface deformations that, for the tiniest, require high resolution techniques and skin color may show sudden and/or subtle changes (inflammation, sun exposure, aging, photo–aging…) that need to be precisely determined. The continual development of safe and photo–stable sunscreens (UVB's to long UVA's) greatly benefited from such techniques.[98–100]

In vitro, the intense and successful development of reconstructed skins[33,101–107] or hair growth model[108] obeyed to both safety and efficacy objectives that logically offered a deepened knowledge in the cutaneous physiology. As for safety issues, some models are now validated and integrated by the European legislation,[109] as alternative to animal tests. As for efficacy, reconstructed skins allowed the respective physiologies of epidermis or dermis[110–113] to be better described and understood. This *in vitro* approach shed light on the relationships between different cell types, particularly on the skin pigmentation process, the development of photo–aging and its prevention by broad spectrum sunscreens.[114] These models were applied to diseased skins (Psoriasis, Xeroderma Pigmentosum.[115,116] *In vitro* hair growth leads to obtain a fiber of an identical structure to that of a "real" hair and shows a similar growth rate (approx.0.3mm/day) for 2 to 3weeks. This model allowed the factors that govern hair growth, hair structure and its 3D shape to being better characterized.[117–121]

Converging fields of research

From an individual aspect, being a patient or a consumer, cosmetic products are not only dedicated to a normal/healthy skin but are often precious allies of some dermatological interventions. Many efficient dermatological ailments (oral or topical) bring side effects (skin dryness/xerosis, irritation, increased sensitivity to sun exposure, photo–allergies..) that are to a large extent soothed or mitigated by adequate cosmetic regimen (moisturizers, sunscreens, calming agents). In brief, some cosmetic products become indispensable companions of comfort within some therapeutic strategies, where the "diseased" has to take precedence over the disease.

Cosmetic procedures (skin care, making up, hair styling, hair dying..) are precious allies to a better well–being or self–confidence to seriously ill or disfigured people.[122–125] The quote "*The beauty Industry was almost allergic to science"*[44] seems however a too authoritative and unrealistic statement, contradicted by the vast amount of cosmetic–related publications in peer–reviewed Journals and its important investment in research (2 to 5% of incomes). It nowadays represents a high commitment to innovation that employs, worldwide, some 25,000 researchers, many of them possessing upper level scientific backgrounds from diverse disciplines. In many cases, the researchers of these private groups are associated with national academic institutions under Industry–Government agreements (the open innovation process) for sharing high competence and/or technological expertise.

Hence, cosmetic research can hardly be considered as a "bachelor" scientific domain. It is a close companion of all researchers involved in the study of these complex and mutual relationships between the physiological and psychological needs of all humans.

Conclusion

The scientific studies dealing with the facial appearance of humans comprise various objectives, e.g. medical, psychological, social, and cosmetic…that all impact social and personal behaviours at different levels. These aspects, when admixed, perfectly follow the definition of health as established by the World Health Organisation that comprises physiological and mental aspects. In brief, humans–or animals–can hardly be reduced to mere physiological entities. It appears evident that cosmetic research, aiming at adorning, protecting or conserving at best the human facial appearance, of strong intimate and social consequences, is a precious ally to humans of all ethnics and conditions. As such, contrarily to so common pre–conceived assertions, cosmetic research is far from pursuing a futile assignment. The various facets of the illuminating articles published, as supplements; by the Journal "*Nature*" indeed converge to greatly support such evidence.

Acknowledgements

BA Bernard and J Leclaire are L'Oréal employees.

Conflicts of interest

The authors declared that there are no conflicts of interest.

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