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AUTOMOTIVE DESIGN CULTURE: AESTHETIC TRENDS ORIGINATED IN TECHNOLOGY

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ABSTRACT – Ever since the Futurist's Manifesto, first to see the inner beauty of speed and progress symbolized in the form of early automobile's mechanical parts, automotive history has often experienced paradigms of technological breakthroughs grown popular to establish aesthetic trends. The car, this highly influential cultural icon of the last century, has often drawn its stylistic inspiration in the product's technological nature, in the attempt to express visually human's inherent need for more power, for "better and faster". Great pipes on early racing cars (1910's), recalling images of "snakes with explosive breath", had soon given their place in a new formal language, an aesthetic refinement known as streamlining (1930's). The expressive force of streamlining, made it synonymous with 'design', sculptural intensity and 'vigorous motion' even when standing still. It provided an effective visual metaphor for progress, which soon became a formal topos and established an aesthetic trend later extended to a whole series of industrial products, often alien to the idea of motion. Aircraft-referential tailfins on American cars of the 50's, took automotive styling into the supersonic age, expressing the power of flight and the optimism of the post-war period. The 1973 oil crisis brought up an automotive culture, which shifted the goal from maximization of speed to the optimization of effectiveness. Within this context, streamlining has retained its significance, now justified in terms of ecology and environmental politics. Having managed to split the ultimate goal of the least possible wind resistance from the 'shape' in which it appears, modern aerodynamics defined a new formal language, quite different from that of streamlining, but still attached to our inherent tendency in Modernism. Such tendencies have met their formal expression through other engineering achievements as well. Following Ralph Nader's book "Unsafe at any speed", stricter laws and the extended research upon passive safety, have turned protection into a major issue in automotive culture. Consumer's attitude towards safer cars, apart from engineering improvements, has brought about aesthetic changes necessary to serve the subjective 'feeling' of safety. Low seating position and protective surrounding interiors, bold and muscular door sections, generous pillar dimensioning, surface development to convey substance and durability, and prevalence of full over empty space, are typical styling features of recent automobiles, modeled to look robust and safe. Further developments in technology of glass, have allowed penetration of light via extended sunroofs, resulting in lower side windows and high waistlines in favour of dynamic and protective body profiles. While, achievements in advanced materials and lighting technology already introduce minor styling cues effecting consumer's perceptions of progress and modernity. This paper, forming part of an extended PhD research on social issues in car design, aims to research the inner relation between technology and socio-cultural trends and how effects of the former upon the latter are reflected on styling of industrial products such as the car. Study of this complex interaction between engineering achievements, cultural horizon and perception of progress and beauty is crucial for a deep understanding of market trends and an effective design manipulation of contemporary technologies (regarding drive by wire, ITSs and alternative fuels) towards more friendly and desirable automobiles.

MAIN SECTION

Ever since the Futurist's Manifesto, first to see the inner beauty of speed and progress symbolized in the form of early automobile's mechanical parts, automotive history has often experienced paradigms of technological breakthroughs grown popular to establish aesthetic trends. The car, this highly influential cultural icon of the last century, has often drawn its stylistic inspiration in the product's technological nature, in order to express visually human's inherent need for more power, for "better and faster". However, this close relation between engineering and aesthetics – inseparable but still opposite sides of the same coin – has not always been a fruitful love affair; for machine aesthetics have not always been popular among the masses. An in-depth investigation that traces the inner links between machine aesthetics and public taste throughout history is therefore necessary to enlighten this socio-cultural phenomenon of high-tech image consumption.

CAR AESTHETICS: HISTORIC STAGES

From early hydraulic mechanisms in ancient Greece up to the "machines célibataires" mentioned by Michel Carrouges and the "Colonia Penale" of Franz Kafka – machine, often endowed with almost mystical powers, was treated as the evil to be exorcised. Full of bloodthirsty cogwheels recalling cruel images of torturing devices, it was no surprise that early machines had rather kept their innermost mechanics covered. Only with Leonardo Da Vinci, machine grew bold enough to show off its entrails and later transform them into the main subject in work of engineers such as Rameli or Branca.

According to Lewis Mumford(1), during the early industrial era, the mass produced object was still divided in two parts with the first designed to serve mechanical efficiency and the second decorated according to the rules of a totally different kind of art; paradigms of various industrial objects -from locomotives to typewriters- decorated with naturalistic patterns, are the case. This was no other than an art industrially produced and yet ashamed of its very origins. Something quite natural if we consider the time lag that always intervenes between innovation and public acceptance.

Morphological innovations deriving from cutting-edge technology are hard to accept by the majority of people, for whom regular cohesion takes the place of active aesthetic assessment. For example, a totally new form, such as the tubular chair of Mies van der Rohe, was rejected by the average consumer of that era, who rather preferred heavy furniture, with ornament in forms of spiral curves and decorative cornices. However, the very same average person was more likely to accept modern aesthetics when no coherence could be made, as for example in the case of early aeroplanes. When the airplane was developed, it was an all-new problem. Its requirements were such that it never occurred to anyone to base its design principles on, for instance, a carriage with wings. On the contrary, designers of the first automobiles were not able to free themselves from the precedent of the horseless carriage or coach, taking much the same view in their work.(2)

During the early period of largely utilitarian development of the basic automotive form, not much conscious attention was paid to aesthetics as such. However not few were the pioneers to recognize the beauty of machines themselves. By 1910, the German writer Joseph-August Lux was already suggesting in his book Ingenieur-Aesthetik the beginning of a new era with its distinctive character exclusively taken from machines and its civilization reflected on vehicles and transport engineering(3). While Italian poet Filippo Tommaso Marinetti first expressed the brutal excitement of speed and danger aroused by the new machine –the car- in

the ‘Futurist Manifesto’ published in *Le Figaro* on 20 February 1909: “We declare that a new beauty has enriched the splendour of the earth: the beauty of speed. A racing car with his bonnet adorned with giant tubes, serpents of explosive breath… a roaring automobile, which seems to run on grapeshot is more beautiful than the Victory of Samothrace”(4).

The idea that mechanical objects evolve functionally towards an ideal form has fascinated artists and architects since the early 20s. French artist Fernand Léger argued that “in the case of the evolution of the automobile, the more the machine perfects its utilitarian functions, the more beautiful it becomes”, while Buckminster Fuller used to say: “When I am working on a problem I never think about beauty. I only think about how to solve the problem. But when I have finished, if the solution is not beautiful, I know it is wrong”. However popular between theorists, the “form follows function” argument was not necessarily consistent with the mainstream consumer aesthetic trends. Automotive design, which was still bifurcated into mass and craft vehicles at that time, saw the rise of the first stylistic concerns initially applied in the luxury one-off models. Indeed, these craft-made vehicles developed integrated and coordinated shapes produced by a laborious craft process within specialized “carrozzerie”, while mass-produced vehicles developed a disjointed, rectilinear form adjusted to the requirements of the deskilled production process.

This growing aesthetic gap testified to the growing class cleavages produced by Fordist mass production(5). When soon the struggles of American workers against the degradations of Fordist production forced up wages and allowed them to construct a world of insulated mass consumption, companies found that in order to sell cars to this growing market, they had to cover the telltale marks of mass production and class differences.

Streamlining

The attempt to camouflage the tainted factory origins of autos resulted to the streamlining craze of the pre-war period. Streamlined styling provided the ideal organic shell able to hide the fragmented mechanical reality of the capitalist production process by referring to a world beyond or before the domination of things and people by the logic of exchange value(6). Even if streamlining has often been accused of being more effective as a “metaphor for progress” and less as a scientifically sound method for improving car performance(7), one could hardly ignore its very origins in aerodynamic research.

Since the invention of the car, engineers, scientists and tinkerers had often tried to improve its performance by reducing wind resistance. European engineers, forced by high gasoline prices and heavy horsepower taxes, were the first to apply the emerging science of aerodynamics to cars in order to maximize engine efficiency. As soon as the early 1920s, and following the original spirit of Alfa Romeo Aerodinamica 40/60 HP, designed by Ercole Castagna (1913), engineers like German Edmund Rumpler, Wunibald Kamm and Paul Jaray experimented with teardrop-shaped vehicles in wind tunnels. Such shapes made their way onto racing cars and even production vehicles by Maybach, Audi and Mercedes-Benz. The Czech-made Tatra 77 (designed by Viennese engineers Hand Ledwinka and Paul Jaray in 1934) is said to be “the first mass-produced car to have structural aerodynamic styling based on scientific studies that transformed mere sleekness of design into a genuinely structural body shell”(8).

First with experimental concepts like Buckminster Fuller’s Dymaxion Cars I, II and III and William Stout’s Scarab, to be followed by aerodynamic production cars such as the 1934 Chrysler Airflow, American automobile industry entered the Depression-era with two competing visions of streamlining. The engineers promoted a functional engineering of the

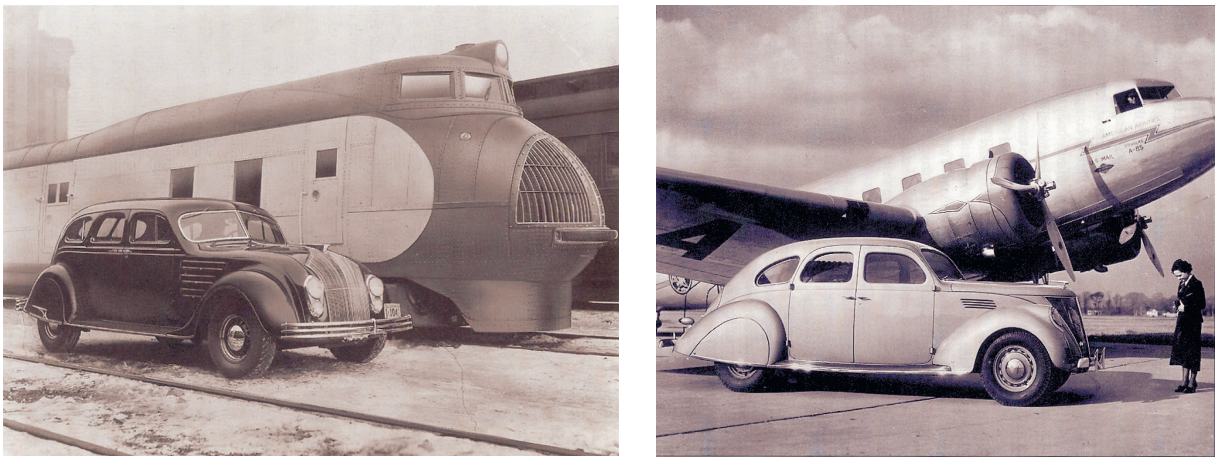

Figure 1: Functional Streamlining as applied by engineers on the 1934 Chrysler Airflow (left) led to disastrous market results, in contrast to the 1936 aesthetically streamlined Lincoln Zephyr (right), which proved a great commercial success. Note in both cases, the visual reference to other technologically advanced modes of transport of the time. *(source: "Auto Opium, A Social History of American Automobile Design", Routledge, 1994)*

automotive form to achieve economy and boost their position within organizational structures against stylists. Stylists on the other hand, pushed the aesthetic styling of the car's skin to cover the mechanicals and carry connotations of progress and romance, thus achieving to win the organizational struggle to control streamlining, mainly due to their superior understanding of the automobile as an ideological icon in American culture. The commercial success of aesthetically streamlined cars like the 1936 Lincoln Zephyr against the disastrous market results of functional streamliners as the 1934 Chrysler Airflow, came to prove the triumph of aesthetic over functional streamlining.

This story gave the automotive industry a useful lesson: consumer's hunger for novelty regarded more the symbolism of technological progress and less engineering innovation itself. Therefore styling was a necessary industrial tool to control the gradual transformation of traditional automotive architecture and symbolism, by providing only the right amount of novelty in order to avoid disastrous market results. Only through superficial styling functionally engineered forms managed to become an ideological fetish for the technological progress that took America to a consumer utopia(9).

So influential was the expressive force of streamlining, that soon became a formal topos and established aesthetic trends applied to a whole series of industrial products, even irrelevant to the concept of motion. Therefore, next to cars, locomotives and airplanes, soon appeared streamlined electric appliances such as refrigerators, radios and vacuum cleaners, even vending machines and pencil-sharpeners. However, there were also several functional reasons for those countless products imitating the formal language of streamlining: rounded forms reduced the danger of injury, were more pleasant to hold and easier to clean. "In this context, the spectrum of formal relationship influenced by streamlining, extends from direct and imitative adoption of the 'teardrop shape' to more indirectly perceptible inner correspondence in the use of parts with smooth surfaces".(10)

Overviewed in terms of design history, streamlining introduced the idea of giving homogenous form to previous unconnected parts. Elements were brought within a line and modeled into a sleek whole(11). Even if originally applied in the attempt to camouflage the

fragmented mechanical reality of inner car, streamlining as a formal language of flow dynamics is itself originated in technology.

1950s – The American Dream

The end of the World War II saw the dawn of a new form of consumer culture, an age of change when technology and culture was infused into the products of Detroit's production lines, creating unparallel states of desire(12). With the American automobile being at the center of the postwar system of consumerist containment and Cold War ideology, the industry seek to express the optimism of the era by taking styling towards long, low, cliché-ridden dream machines that spoke more of stratospheric travel than mundane transportation.

Therefore, a new chapter in the automotive history began, based on an explicit comparison between the great technologies of the age – fighter planes, space travel and atomic power – and the consumer reality of the car. Harley Earl's Cadillac Styling Studio was the first to seek inspiration from the aeronautical industry by introducing tail fins on the 1948 Caddy. This cliché, taken from the Lockheed P-38 Lightning, managed to lend sheet metal the allure of technological progress, military superiority and escape. Rocket-style fins, these infatuating little symbols of aviation, grew to fantastic heights and together with curved windshields, razor-thin roof pillars, bullet grills, jet-exhaust taillights and dart-like trim soon spread to all American automobiles leading to an unprecedented period of fantastic automotive excesses. Similar to the elements in the vocabulary of style, the very names of new models signalled the dreams of the age: Meteor, Wasp, Super Wasp, Century, Firedome, Thunderbird, Galaxie, Comet and Star Chief.

Within this spirit of post-war optimism, people's hunger for novelty gave birth to the dream cars. Harley Earl, spiritual father of car styling in the early 30s, now laid claim to the invention of the concept car, i.e. the "houte couture" of the automotive field. Earl's concepts like the 1950 LeSabre set the aesthetic agenda for a whole decade bearing practically every styling feature that finally made it to the production line. While other cases of dream cars like the Firebird II brought the future forecast to its very limits, taking automotive styling straight into the supersonic age: no surprise that GM advertised it as "tailoring car design to gas turbine power" designed for the "highway of the future".

In the same way that streamlining had been an effective visual metaphor for progress in the pre-war auto industry, the aeronautic-referential styling cues of Detroit 1950s' baroque also symbolised the future without necessarily providing any technical advantage. On the contrary, bigger and more frequent doses of superficial style changes stimulated consumers to buy a new car more often, thus allowing auto manufacturers to accelerate market turnover without risky and costly engineering innovations. This contradiction was quite typical of a nation reared on the image. Unlike European automotive culture, which employs high-tech aesthetic trends originated in automotive engineering progress, American car styling has often experienced interesting paradigms of raw high-tech symbolism imported from other disciplines. In a society starving for progress, so strong was the visual impact of these longer, lower and wider aeronautical proportions, that they soon find their way apart from the auto industry to architecture also. The American automotive dream was so closely linked with expansion of suburban housing, that similarly proportioned (long, low and sleek) suburban houses were portrayed as a perfect match for the autos of the era.

While the U.S. automakers were inspired by pictures of jet airplanes torn from glossy magazines, in Italy, designers of outstanding "carrozzerie" as Bertone and Farina were far

more concerned with finding absolute forms of sculptural beauty to make metal sing. Far from excessive symbolisms and styling acrobatics, postwar European design also sought ways to express technological progress though more discreet: it eliminated the last traces of the assembled, mechanical appearance of the car by unifying all the fragments into one organic shape. Resembling the monocoque shells of sleek airplanes, European cars gradually started to incorporate hood, fenders, body and top into one smooth shape.

The end of (A)utopia and the emerging pragmatism

By the 1960s, consumers started losing their tolerance for the bizarre futurism, as the naive belief in technological utopias was irreparably shaken by exposure of the dark side of consumer culture. A new cynicism entered the consumer consciousness. Vance Packard with *The Waste Makers (1960),* and Ralph Nader with *Unsafe at any speed (1965),* started to question the system in America, to be followed by other European advocates of industrial responsibility. French director Jean Luc Godard with *The Weekend* commented on materialism, greed and the acquisition of status, in a satirical film on bourgeoisie society to explore the meaningless brutality of auto consumerism. While André Görz raised the anathema on autophilia in his article *The social ideology of the automobile*(13).

Beyond any doubt, this era marked the end of inconsiderate consumption and the birth of a new, more socially conscious consumer. The new-launched Concorde, symbol of technological progress at time of project briefing, now struggled to find its way to airline service due to high fuel consumption and inability to comply with American noise regulations.

Relations between technical innovation and image of progress entered a new phase of pragmatism. Within a context of political correctness, cars attempted to justify their existence, no more as symbols of freedom or objects of desire, but as practical transportation means and life containers. Functional boxy shapes appeared in all modesty, to reflect no more than optimal technology in efficiency's service.

The aero look

To face the repercussions of the 1973 oil crisis, automotive technology further shifted the goal from maximization of speed to the optimization of effectiveness. Within this context, streamlining has retained its significance, now justified in terms of ecology and environmental politics. Having managed to split the ultimate goal of the least possible wind resistance from the 'shape' in which it appears, modern aerodynamics now defined a new formal language, quite different from that of streamlining, yet still attached to our inherent tendency in Modernism.

Citroen's consistent faith on applied aerodynamics research had given masterfully streamlined paradigms in the past: from the legendary DS 19, to its 70s' successor named CX after the French translation of the acronym Cd (Coefficient drag). However, none of these cars ever been mainstream trendsetters, given Citroen's rather alternative avant-garde profile. Many of the aesthetic trends originated in aerodynamic research and carried over to car styling up to date, cannot be better traced elsewhere than in German manufacturers like Audi, Mercedes and BMW.

With an expertise in aerodynamics dating back to Auto Union's streamlined racers of the 1930s, it was no surprise that Audi was one of the first to take this renewed interest in

aerodynamically engineered shapes. Extensive aerodynamic research and wind-tunnel testing soon came to fruition with the Audi 100 of 1982, the first production four-door car with a coefficient of drag of just 0.30. Soon followed by Audi 80 based on similar design principles, the 100 became a major trendsetter, with most of its engineering and styling innovations surviving up to present cars. Worth mentioning was the dynamic profile thanks to a decisive straight waistline aligned with the hood and boot, clearly dividing the body in two parts with the upper structure incorporating a steeply raked windshield (first time directly glued onto the body) and flush-fitting side glazing.

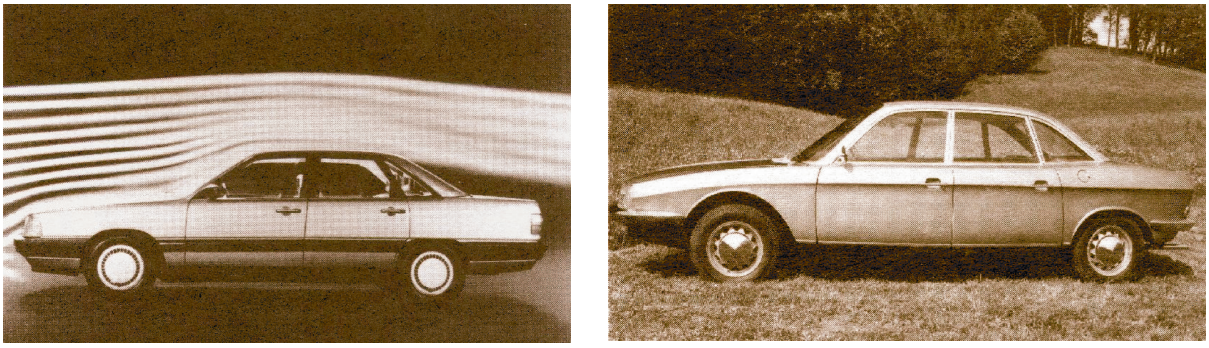

Figure 2: The aerodynamic Audi 100 of 1982 (right) set the design agenda for the 80s. Note the obvious similarities with the 1967 innovative NSU Ro80 (right): a forerunner of car design trends reintroduced and widely accepted only 15 years later. *(source: "Automobile: Glossario dello Stile", Giorgio NADA Editore, 2000)*

One could hardly ignore the obvious visual similarities of the Audi 100 with the much earlier introduced NSU Ro 80, designed by Claus Luthe and produced from 1967 to 1976. Despite its innovative design and engineering with a notably low cx of just 0,355(14), Ro 80 never managed to become a commercial success. However, it managed to win itself a significant place in automotive history, as a forerunner of car design trends reintroduced (and commercially accepted) 15 years later.

Many styling cues of the aero look, introduced by Audi 100 and other contemporary models such as Mercedes 190 (1982) and the Ford Sierra (1982), have later been transferred to the majority of subsequent cars, with their technical origins being present or not. Fairly inclined windscreens -with the degree of inclination subject of gradually further increase- were since universally incorporated, even when not functionally justified. Thus, we now see steeply raked windshields on utilitarian cars for exclusively urban use or even on tramcars, where low average speed does not justify the necessity for aerodynamic efficiency. So strong is people's perception of this feature as modern and technologically advanced, that it was incorporated in ABB Strasbourg Eurotram as a merely styling feature to provide a friendly image, similar to that of cars(15).

While Audi's flush-fitting side windows visually unified with the black-painted roof pillars in favour of a more dynamic profile, have survived –as a technical or mere styling feature– in a number of successive models, from the 1989 Citroen Activa concept, to production cars such as the 80's Toyotas (Corolla and Celica) or the Ford Probe. The visual impact of unified side glazing is so strong in terms of styling and symbolism that it often appears as the extra feature on better equipped models, even if notably lacking the functional justification of flush-fitting. Only in recent paradigms of utility urban commuters (like Suzuki Wagon-R), B-pillars have regained their visual independency in favour of a more functional appearance.

David Gartman, in his book “Auto Opium: A Social History of the American Automobile Design”, describes cues of the 80s’ machine aesthetic that became synonymous of German national identity and highly influenced American car design: “On these upscale examples of Germanic functionalism, the austere three-box designs turned into sensually rounded but frugally decorated shapes. The large radiuses of the curves seemed to convey substance and durability – as if the metal was so thick that it could not be bent tighter – as well as wind-cheating efficiency… Here was an aesthetic of distinction, substance and efficiency that exited the hearts of many upscale entrepreneurs and professionals, making these German marques the badge of the Yuppidom.”(16)

Indeed, American automakers soon began to copy the European design aesthetic as a way to capture the optimistic mood of the new successful class of the Yuppies, and its demand for distinction, yet a distinction not opposed to its lean, healthy, non-polluting lifestyle. Ford was the pioneer of this imported ‘aero’ trend with its 1983 Thunderbird. On the big question whether this reincarnation of the streamlining craze in America was merely a “look” as in the 1930s or it was now authentically functional, some would argue that although fuel economy was important, further more important was the fact that this look became associated in consumer’s mind with high-tech, efficiently engineered automobiles.

The “aero” aesthetic widespread so quickly to become a kind of uniform for mass-produced cars. Inclined windscreens, elevated boot, embodied rectangular headlights and other features dictated from regulations and scientific data, produced a stylistic blandness that, with only few exceptions, made one car visually indistinguishable from another. So strong was their domination on the appearance of the automobile, that inspired L.J.K. Setright’s comparison between cars and freezers in an article to proclaim the car losing all its romance, mystery, fascination and cult status and becoming a purely utilitarian tool, quite alike kitchen appliances(17). The dramatic results of this pragmatism over design were not subject to change before the 1990s, with the revamp of Styling in the rise of a new culture to recognize that the car was no longer an icon of modernity or merely utilitarian tool, but rather a lifestyle accessory.

SAFETY

Apart from environmental protection, safety was next to augment the anxieties of the anti-car lobby in the late 1960s. Ralph Nader’s *Unsafe at any speed* was soon followed by the ESV program (Experimental Safety Vehicle) launched in the USA in 1971 and adapted by most of European carmakers. With passenger protection turning into a major issue in automotive culture, car manufacturers intensified more that ever before their research on both active and passive safety. The introduction of increasingly firm regulations together with the marketing policy of German manufacturers to promote their cars as pioneers on safety issues, have gradually forced all automakers to follow.

However, consumer’s attitude towards safer cars, apart from the engineering improvements, has brought about aesthetic changes necessary to serve the subjective ‘feeling’ of safety. Cars of the new era not only ought to be safe, but to look also. Therefore, while engineers were struggling to make cars safer, designers were introducing a series of design and styling features to communicate these objectives visually. Low seating position and protective surrounding interiors, bold and muscular door sections, generous pillar dimensioning, surface development to convey substance and durability, and prevalence of full over empty space, are typical styling features of recent automobiles, modeled to look robust and safe. First born in German design studios, such features became key elements in the vocabulary of German

Figure 3: Despite their different styling cues, Alfa 147 and Audi A3 share a common robust proportioning and surface development to convey substance, safety and durability. *(source: www.cardesignnews.com)*

national identity, and grown popular enough to be successfully exported in products of foreign automakers. Thus, we nowadays experience paradigms of Teutonic design in Alfa 147, Fiat Stilo, Renault Megane and so on. Generous solid proportioning thanks to high DLOs and small openings is a styling feature that apart from corporate identity serves the image of safety that most consumers seek out. So as it is hard to say whether a car looks solid because it is safe or is safe because it is made solid. And that brings us to one more design factor imposed by the progress on glass technology: transparency.

TRANSPARENCY(18)

The evolution of automotive forms, has always been (to some extent) dictated by glass technology and the physical limits imposed by glass as a material. On the other hand, car design and styling, with numerous requirements for the glass used, has offered the challenge and feedback to determine the development of advanced glass manufacturing processes.

Within the historical context of streamlining and the extensive research on sculptural forms, glass played a significant role. Although early paradigms of streamlined cars were still incorporating flat glazing –with V-shaped windscreens to facilitate aerodynamic efficiency and aesthetics– technical progress soon allowed the curvature of glass and freed designers to explore far more expressive forms.

By 1957, nearly all U.S. cars had windshields that curved in both directions, horizontally and vertically. As already mentioned, the wraparound windshield, that the very idea of it is likely to have derived from the bubble canopy of the Lockheed P38, became a significant motif in the post-War American car styling, changing the appearance of the car's whole upper structure. The hold this visual device had over an entire American generation, illustrated the extent to which a public, experienced in the business of consumption, could apply subtle degrees of social evaluation to degrees of curvature in glass. With the panoramic windshield you were fashionable, without it you were *demode.* American styling of this era often pushed glass technology at its very limits. Engineers were often confounded by the precise shape of the curved windshields that were instructed to fabricate and failed to find mathematical formulas for their construction. Additionally, these windscreens suffered unresolved problems of distorted vision. It was a typical example where demands of the market created, override the simpler laws of science.

Since then, automotive glass manufacturing technology has mainly moved towards the direction of improving glass specifications rather than introducing radical changes. Therefore

today, while degrees of curvature are well enough to provide aerodynamic efficiency and continuous flowing lines in body design, are also kept within some technical limits to ensure optimum visibility. Advanced technology and manufacturing processes provide glass products with constantly increasing safety features: impact resistance, heat protection and visibility optimization. Due to the continuous technical progress, glass has now started to perform many more functions: we therefore witness defrosting windscreens with incorporated radio aerial, impact resistant, heat-reflective and soon coming anti-intrusion and water-repellent glass.

Particularly solar glass, developed to absorb some of the infrared heat-producing radiation, ensures to keep the car interior cooler thus allowing large glass surfaces and steeply-raked windscreens with no resulting greenhouse effects. Consequently, a new design trend seems to evolve lately: increasingly large glass-roofs start to appear in a number of car typologies from sport coupes to crossover vehicles. This affects the whole upper structure of cars, which now becomes transparent to an extend unimaginable so far. Penetration of light through the roof allows smaller side windows and consequently higher waistlines able to produce entirely different profile proportions in favour of dynamism and visual robustness. Generous panelling over side glazing, creates a horizontality which enhances the impression of a stretched body synonym for speed, while at the same time introduces a solid and often aggressive formal language, popular due to present socio-cultural trends of uncertainty, defence and insecurity.

LIGHTING CLUSTERS: FROM FUNCTIONAL ITEM TO AESTHETIC FACTOR

Lately, we experience a notable creative trend for designers to use lighting clusters as determinative elements on the design of the car body form. Indeed lamp clusters, according to a popular metaphor symbolize no other than the eyes of a car in the overall form of the front or rear-end considered the “face”. Their overall shape, colour and transparency give the car an expression and enhance its personality. Especially in recent years, with the car having become a lifestyle item –friendly by means of zoomorphic or anthropomorphic characteristics, lamp clusters have a critical part to play in car design. This was made possible thanks to a series of technological innovations that have allowed a great freedom in the design and construction of these elements, that for long ago had remained mere functional items to illuminate the road ahead.

In the early motoring years, cars employed pairs of acetylene lamps carried over form the horse-drawn carriage. These were replaced by electric lamps as soon as the latter grown able to withstand road vibrations. The archetype of circular headlights consisting of the lamp, the parabolic reflector and the protective glass cover remained principally unaltered for decades, first placed as autonomous elements adjacent to the dominant radiator and gradually encased in the overall shape of the body form. With an exception of the Citroen DS 20 to incorporate double circular headlights under an almond-shaped clear glass cover, conventional round headlights remained a governing pattern in automotive styling. It was no earlier than the 1960 that lighting clusters abandoned the circular form of their original technical structure to explore alternative forms like the oval lamps of the innovative Ford Taunus 17M model P3. Soon front as well as rear clusters started to appear in rectangular and trapezoid forms giving birth to a leading aesthetic trend: almost every single model now had its circular lights replaced with rectangular ones making this the common rule of every single face-lift. At the turn of the 70s, Simca 1000, Fiat 128, even the legendary Citroen 2CV were all restyled following this widespread trend.

A further revolution in optical groups came in the 1980s thanks to new materials and lighting

technologies. The evolution of the reflection cone itself, along with the introduction of a lens in between the lamp and protective cover to direct the light beam, has freed the latter from its previous function allowing it to be perfectly clear. With such innovations, form applied to lighting clusters could only be limited by the technology of glass. Restriction made possible to overcome with the introduction of scratch-resistant transparent polycarbonate. First applied in Japan as early as 1986 and transformed in Europe in 1992 after the necessary legislative changes, this new direction led to the realization of complex forms like the Ford Ka lighting clusters, distinctive feature of the model itself and progenitor of a whole new Ford stylistic trend, known as "New Edge Design".

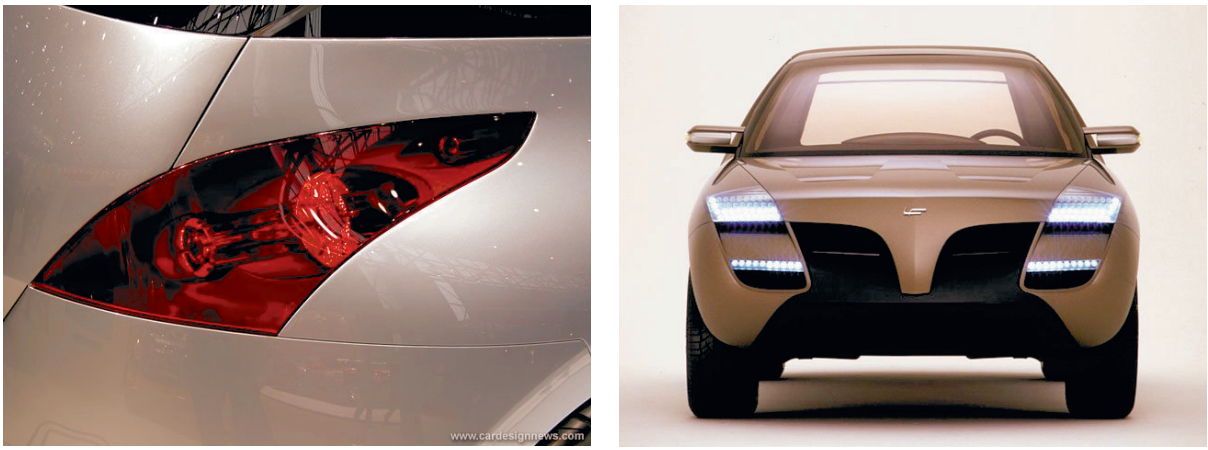

Figure 4: Rear clusters of the Nissan Evalia concept car (left) incorporate lighting patterns that rotate at increasing speed as the brakes are applied harder. Fioravanti Yak features LED headlights with odvious aerodynamic and aesthetic advantages. *(source: www.cardesign-news.com)*

As the use of transparent polycarbonate covers made the inner workings of the lamp cluster visible, new lighting patterns started to appear as distinctive features of particular models. First Generation Fiat Bravo employed a combination of circular and roll-shaped light sources grouped under translucent covers of a more complex shape, visible only when lit up. Rapidly automakers realized the new graphic opportunities offered to make their cars distinguishable even at night using trademark lighting patterns. Renault new Megane's rear brake and side lights for example, placed vertically in combination with the horizontal trigonal reflectors are immediately recognizable as belonging to this particular car. Quite alike the introduction of rectangular headlights 30 years ago, complex groups of autonomous lamps under one single clear cover became the typical aspect of every model gone under restyling. Optical groups in form of illuminative sculptures became the much and mass desired symbol of technological progress and modernity to characterize a series of models such as the VW Golf IV, Fiat Punto II, Mercedes new C and E class, the restyled Alfa 156 and many others.

Advanced LED and fiber optic technology applied in a series of latest concept cars like Nissan Evalia and Fusion, Audi Nuvolari and Pikes Peak, Volvo Versatility Concept, Pininfarina Enjoy and Italdesign's modern interpretation of Corvette – the Moray, already offer a new platform for aesthetic innovation. In the Fioravanti Yak, presented on the 2002 Geneva Motor Show "all the (lighting) functions are integrated into specific units made of new generation extremely efficient LEDs with special lenses, which are, on the whole, controlled by a software to obtain different light beams"(19) according to road conditions. As each component is very small, this innovative array of lamps can be extremely thin, almost a layer of light, and adaptable to any surface shape; thus having aerodynamic and aesthetic advantages. Unlike the case of radical transformation of automotive architecture and

symbolism, styling innovations partially applied on the car body are more easy to accept by the average public taste, thus making aesthetic trends originated in such technologies likely to emerge in a short-term basis.

PERCEPTIONS OF MODERNITY IN THE POST-INDUSTRIAL ERA

The beginning of the Post-Industrial Era in the last two decades has indicated a technological shift from the mechanical to the electronic-orientated perception of progress and modernity. We nowadays experience "a shift form product to service", the car being more of a mobility service and less of an object. The machine which by course of time demystified itself gradually having its anatomy exposed and aesthetic accepted, now falls back into oblivion; becomes immaterial though yet present, claiming new "magical powers".

This transition tends to deconstruct the traditional triptych of interdependence between function, construction and aesthetics(20) in favour of a new model where construction is represented by the hardware, function by software and aesthetics by styling. In this new reality, it is software rather than hardware that mostly defines performance. This gradual separation between form and function does not seem to bring styling in the forefront; on the contrary, by eliminating engineering constraints it allows a new, holistic design approach to include fundamental architectural aspects like packaging and typology. Note the flexible interior of Bertone Filo, totally freed thanks to Drive-by-Wire technology, or GM's latest concepts on alternative fuels, able to bring radical changes in the overall architecture of future cars.

"Intellectual" machines of the digital age are electronically programmed to perform particular functions: they no more consist of cogwheels, bolts or pistons. Within this frame of electronic culture, we seem to experience a new kind of hypocrisy: anything coming under the sense of conventional machines (combustion engine or otherwise) is considered obsolete and is therefore hidden behind colourful stylish covers to fall into line with the digital perception of technology and follow the microchip aesthetic. Facing the triumph of information technology, raw mechanics demonstrate an inferiority complex and consequently a prudery that seeks the contribution of styling to hide their nudity. Apart from elegant engine covers, we now witness fixed hoods (Audi A2) introducing a new interface between car and user, with the latter having limited access to essential and clean mechanical parts only (oil and water tanks).

Figure 5: Combustion engine technology, hidden under stylish covers to comply with the digital perception of technology. *(source: www.renaultmedia.com)*

However, employment of elegant styling features to coat raw engineering, is not solely a mere outcome of the digital progress; it comes also as an answer to a widespread social crave for lifestyle gadgets, user-friendly emotionally-arousing industrial objects. It is by reason of such

socio-cultural trends that technology needs to simplify itself. As technology futurologist Derrick De Kerckhove puts it: “The more technology becomes complicated inside, the more it has to be simple outside”(21). Renault lately makes use of the term “simplexity” to describe the attempt to simplify the image of a growing complex technology.

As long as technology aesthetics regarded, we nowadays witness two contrasting trends. On one hand, automotive styling still employs technical motifs or engineering parts on display, where an effective symbolism of speed and dynamism is required. Thus we witness aluminium interior details and geometrical (tool-referential such as spanner-shaped) alloy wheels, exposed disk brakes with red pistons, transparent engine hoods (Ferraris), not to mention more extreme paradigms of engine parts penetrating the hood, popular in American Car Culture. On the other, direct visual references on technology are generally avoided when “utilitarian” typologies are the case; such vehicles are treated more like industrial objects (Ford 021C by Marc Newson) or “mobile pieces of urban furniture” to quote Sergio Pininfarina’s words for Metrocubo.

CONCLUSIONS

Research on aesthetic trends originated in technology could be further extended to include more analogous phenomena in car design history. However, selective references mentioned so far could safely be used to extract some useful conclusions, capitalized as follows:

- Relation between man and machine is inherently dynamic; subject to change according the economic/social/cultural trends of each time and place. Postwar optimism in America produced widely accepted images of technological utopia, while exposure of the dark side of consumer culture in late 60s raised the anathema on autophilia and justified technology in limited terms of optimization and efficiency.
- Technological progress produces morphological innovation and subsequently potential widespread aesthetic trends. These initially regard the design (as a holistic approach) and shift to styling (more as a decorative act). Such aesthetic trends may come from the mimic as well as contradiction of technology.
- Styling innovation partially applied of the car body (LED lamp clusters for example) is generally easier to accept compared with design innovation that may radically transform the overall architecture or symbolism of the car (1934 Chrysler Airflow).
- Symbolism of progress and modernity is not necessarily equivalent to the technology applied. A car may look more or less advanced than it really is, or make use of symbolisms carried over from foreign fields (rocket-fins in American autos of the 50s).
- Automotive design/styling may largely contribute to the embodiment and market acceptance of advanced technology. Therefore, a close collaboration between design and engineering departments is crucial to define the right amount of visual innovation, the ratio of applied technology to symbolism able to secure the commercial viability of the product.
- Engineering produces technical innovation, while social anthropology defines the needs of certain technologies to be applied. Styling moves in-between to bridge real and manipulated customer needs.
- Wide knowledge and deep understanding is useful to forecast market reactions. Streamlining of the 1930s and the ‘aero look’ of the 80s were similarly used as strategic marketing tools in a society craving for the consumption of image.
- Hi-tech styling provide: marketing with a low-cost alternative of advanced technology, engineers with a projection of their achievements and designers with an objective justification for their work, otherwise solely rested on subjective judgement or taste(22).

Study of complex interaction between engineering achievements, cultural horizon and perception of progress and beauty is crucial for a deep understanding of market trends and the effective design manipulation of contemporary technologies (regarding drive by wire, ITSs, fuel cells) leading towards more friendly and desirable automobiles.

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