Special Project

Study of Product Skin and its impacts on today's products.

Kiran Kulkarni

Guide: Prof. Suresh Sethi

Industrial Design Center
Indian Institute of Technology - Bombay

Approval Sheet

The Product Design Special Project -titled
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by Kiran Kulkarni - 02613809 is approved as partial fulfillment of the requirements for Post Graduate Degree in Industrial Design.

Project Guide

Internal Examiner

I would like to express my gratitude to my guide ***Suresh Sethi*** *for his guidance and encouragement over the project. I am thankful to him for giving me insights into dimensions of thinking, which will always benefit me and also making the discussions enjoyable.*

I am very grateful to all the ***faculty members for their guidance.***

I would like to express my gratitude towards all my classmates who often enthusiastically came and threw some light on the project.

Contents

Introduction

Study of product skins is an attempt to view and speculate our traditional notions of surface and its impacts in product communication. With the clues observed in nature it is evident that skin is more than a surface left for your sensory responses. Skins in nature acquire different meanings and relations, which makes our understanding of the object direct, easier and simpler.
An overview of recent technological directions product skin as assumed by the outermost surface of an industrial product takes a new dimension of use and expression.

With the invention of chip and multifunctional use of products, the outer surface is facing a new challenge of product communication. With the disappearing physical features skins behave as extensively used interfaces for various multiple functions and use.

The project aims to expose these issues and suggest design interventions the skin would offer to the problems of contemporary products.

Learning from Skins in nature

Take away the sensations of softness moisture and color ….you take away the orange.
Since it is not a being distant from these sensations an orange, I say is nothing but congeries of sensible impressions or ideas perceives by various ideas; which are united into one thing.

- George Berkeley, 1713

The ripe Orange

Skin is a phenomenon of nature. We refer to skin more often to natural things than the artificial objects. Certain skins evoke responses, which gives you the idea of the object in its state and meaning.
The “ripe” is a state of full-growth. A ripe orange is glowing of the bright orange color . **Skin is the living element of the surface.**

It is easy to distinguish between a ripe fruit from a rotten one. This is the inferred state of the object. It involves our idea of a ripe and rotten from our perceptions and associations.

Learning from Skins in nature

Healthy Child

We often say, “it’s a healthy child” by merely looking at the child’s skin. The health is the physical condition of a being. It also means strength, fitness, and well being of the child.
For Instance, yellow turning of the skin suggests the arrival of a deadly disease called Jaundice. The yellow pigment is from bilirubin, a byproduct of old red blood cells.turns the skin & the eyes yellow.

Learning from Skins in nature

Thorny Pineapple

The oval to cylindrical-shaped,Pineapple is a compound fruit develops from many small fruits fused together. It is both juicy and fleshy with the stem serving as the fibrous core. The tough, waxy rind may be dark green, yellow, orange-yellow or reddish when the fruit is ripe. The flesh ranges from nearly white to yellow. The skin is usually needle tipped and generally bearing sharp, up curved spines on the margins. They may be all green or variously striped with red, yellow or ivory down the middle or near the margins.

The thorny skin gives us a prudence to touch. Skin acts as a warning surface.

Learning from Skins in nature

Old Bark

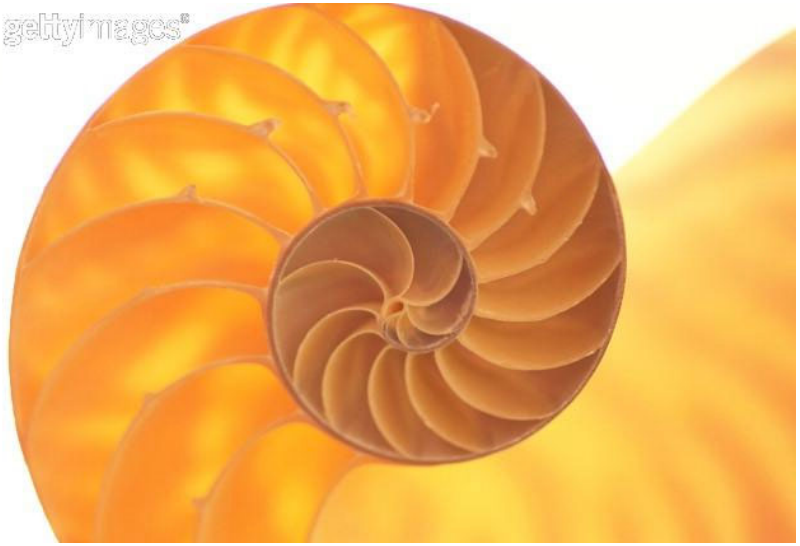
It came from a word that means a strong outer covering. The bark of a tree indeed presents a strong outer face to the world. Whether it is the gargantuan longitudinal ridges of the bark of the giant Sequoia — or the glassy smooth bark of the lemon eucalyptus, this complex covering is NOT just another pretty face. “Bark is all of the tissues, including the phloem, outside the vascular cambium.” The usual rough surface with contours depicts an association of being old.

Often the phrase “old tree is used” since it resembles the wrinkled face of the old people. A certain idea of age is communicated through the bark of a tree.

Learning from Skins in nature

Chameleons are unique creatures known for their ability to change color, they can be seen wearing a variety of colors, including brown, green, blue, yellow, red, black or white. **Communication is an important reason behind these color changes. With color, chameleons can communicate with others, expressing attitudes such as their willingness to mate.** Contrary to popular belief, chameleons cannot display limitless colors and do not change colors in a camouflage response to their surroundings. Instead, their skin changes in response to temperature, light, and mood.

A chameleon's colorful beauty is truly skin deep. Under the transparent outer skin are two cell layers that contain red and yellow pigments, or chromatophores. Below the chromatophores are cell layers that reflect blue and white light. Even deeper down is a layer of brown melanin (which gives human skin its various shades). Levels of external light and heat, and internal chemical reactions cause these cells to expand or contract. A calm chameleon, for example, may exhibit green, because the somewhat contracted yellow cells allow blue-reflected light to pass through. An angry chameleon may exhibit yellow, because the yellow cells have fully expanded, thus blocking off all blue-reflected light from below.



Learning from Skins in nature

Patterns of a Snails Shell

Nature is an infinite resource for **patterns,** which are formed by the natural forces acting on the object. These patterns make the surface. Skins in nature are composed of variety of geometric patterns evoking our visual senses towards the ‘order’.

Patterns were seen as coded messages by many observers always reminding to decode. Patters of nature are inspiration to traditional surface decorations.

Inference

Nature displays an infinite palette of different uses, functions and visual intimations of the skins. **Skins in nature are more than mere surfaces.** They reveal the inner working of a system by exposing the function actively. Skins in nature show the state of the being important information about the condition, situation or circumstance of the object. They respond by changing their character over time suiting to different contexts.

Skin shows the change in nature of the object due to change in color and texture.
Natural skins give a feel of time suggesting growth or ageing. They also conveys varied meanings according to sensorial appeals.

Product Skins - An overview and scope

Industrial products are often thought for a particular use. The user faces products with various challenges. To get into a comfortable experience and enjoy its utility he has to understand it's working, it's purpose and its use. He interacts with the product and learns the way of using it and after a while he gets used to the product. Products influence our way of living by constantly getting used. The outer surface of the product takes a crucial responsibility to communicate about the product.

The invention of electricity in the first half of the century and the invention of microchip in the last decade are the two most influential breakthroughs in technology, which have influenced the design of everyday products.

Technology is crafted for new uses and market. These have made the products quicker, smaller, efficient, accurate and ubiquitous. Their surfaces face new challenges of product communication as the products have become more sophisticated and technologically complex as we invent new uses.

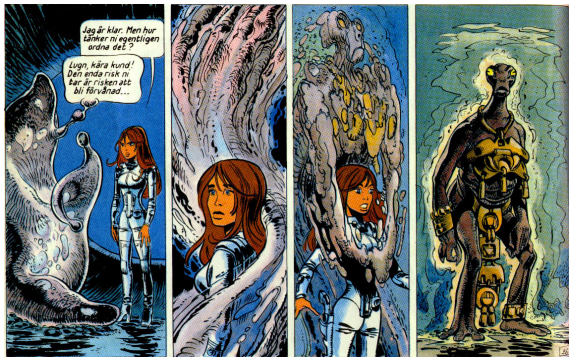
Product Skins - An overview and scope

Product skins refer to the outermost visible part of the product. As inferred from the skins of nature, product skin is an attempt to re look, rethink and investigate the essence of skin and its role in product communication. It is seen in the spirit of the project to conceive Product skins as "that living element" which we experience when we look at the skins of nature. Product skins are not mere coverings or protection shells. They mean more than surfaces, which offer sensorial responses.

Can Product skins be integral part of the products helping in better and composed understanding of the product communication?

Can product skins imitate nature?

The project aimed to probe into clarifying this new assumed definition of surfaces by investigating into recent technological developments and design examples.



1

3

4

Technological Direction

2

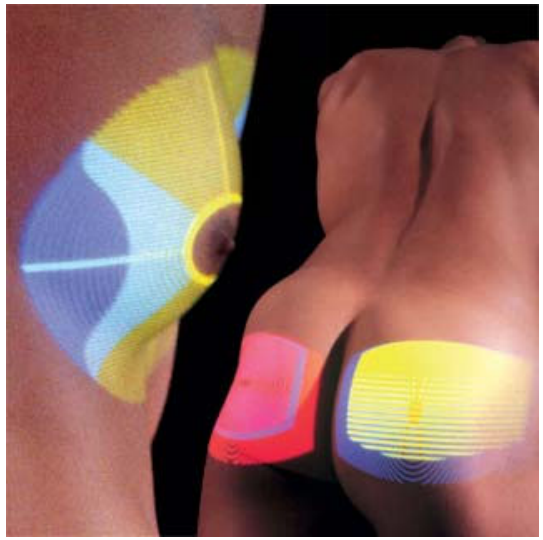
1. Linda & Valerian
Sci-Fi Comic books
(Christin & Meziéres, France, 1967 -)

2. **Plastic Man**
DC Comics
(Cole, J., USA, 1941-56)

3. **Terminator II**
Sci-Fi Motion picture
(Cameron, J., USA, 1992)

4. **Abyss**
Sci-Fi Motion picture
(Cameron, J., USA, 1989)

Colour changing Materials



Thermo chromic

Materials change reversibly colour with changes in temperature. They can be made as semi-conductor compounds, from liquid crystals or using metal compounds. The change in colour happens at a determined temperature, which can be varied doping the material.
They are used to make paints, inks or are mixed to moulding or casting materials for different applications.When attached to the skin these thin films change their colour depending on the skin temperature.

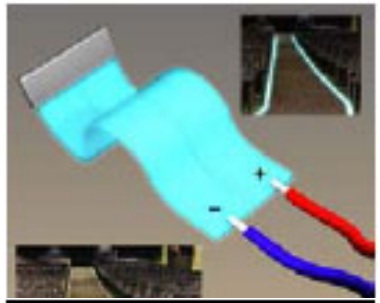
Color changing materials

Photo chromic materials

Photochromic materials change reversibly color with changes in light intensities.Usually, they are colourless in a dark place, and when sunlight or ultraviolet radiation is applied molecular structure of the material changes and it exhibits colour. When the relevant light source is removed the colour disappears.

Changes from one colour to another colour are possible mixing photochromic colours with base colours. They are used in paints, inks, and mixed to mould or casting materials for different applications.

Light Emitting Material



Electro luminescent

Materials produce a brillant light of different colours when stimulated electronically (e.g. by AC current). While emitting light no heat is produced.
Like a capacitor the materials is made from an insulating substance with electrodes on each side. One of the electrodes is transparent and allows the light to pass. The insulating substance that emits the light can be made of zinc sulphide or a combination
They can be used for making light stripes for decorating buildings, or for industrial and public vehicles safety precautions.

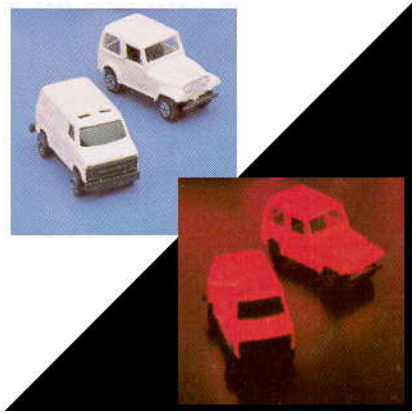
Light Emitting Material

*F*luorescent materials

Fluorescent materials produce visible or invisible light as a result of incident light of a shorter wavelength (i.e. X-rays, UV-rays, etc.). The effect ceases as soon as the source of excitment is removed.

Fluorescent pigments in daylight have a white or light colour, whereas under excitation by UV radiation they irradiate an intensive fluorescent colour.

They can be used for paints, inks or mixed to moulding or casting materials for different applications.



Light Emitting Material

Phosphorescent materials

Phosphorescent or afterglow materials produce visible or invisible light as a result of incident light of a shorter wavelength (i.e. X-rays, UV-rays, etc.), detectable only after the source of the excitement has been removed.

Afterglow effect pigments are polycrystalline inorganic zinc sulphide (green afterglow) or alkaline earth sulphides (red or blue afterglow), and can be used in paints, inks or mixed to moulding or casting materials for different applications.

Light Emitting Material

Organic LEDs

Like the very familiar light emitting diodes in use today, OLEDs are small lumps of material that glow when a voltage is applied. Again like ordinary LEDs, they produce light of various colours, don't make much waste heat, and can be made very small. However, while traditional LEDs are made using semiconducting elements such as silicon, gallium and so on, with normal semiconductor production techniques, OLEDs are made from plastic compounds originally investigated for making amplifiers or switches. The light emitting effect was discovered almost by accident. Because plastics are much easier to work with in production, OLEDs have the potential to be used in many more ways than other displays.

There are two main classes of OLED, small molecule and polymer. Small molecule OLEDs are built up by depositing molecules of the compound onto the display itself under very low pressures, analogous to the way layers of silicon circuits are applied. Polymer OLEDs have the active molecules suspended in a liquid like pigments in paint, and can be printed onto displays using ink jets, screen printing or any of the various contact techniques used for ordinary inks. While small molecule OLED displays are limited in their size by the vacuum chambers used to make them and have the same form as most conventional displays, polymer OLEDs can be huge—Canon has talked about 500 inch displays or greater—printed onto flexible substrates and created very quickly. Resolution approaching 300 dpi is also possible, approaching the quality of ink on paper.

Smart skins
These skis perform well in all conditions (in hard and soft snow). The skins use piezoelectric devices to detect the vibrations and to oppose and cancel it out. This is possible because piezoelectric materials act both as sensors and actuators.
A dampening unit, consisting of three piezoelectric elements, is placed directly in front of the binding of the "smart" ski where the largest vibrations occur.
Any bending of the ski causes the elements to produce a current. A logic circuit in turn induces the elements to move in opposition to the external vibrations, quickly canceling them out.

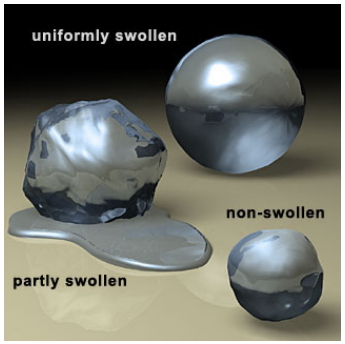
Shape changing Materials

Piezoelectric polymers

Piezoelectric materials are most widely used because of their wide bandwidth, fast electromechanical response, relatively low power requirements and high generative forces.
A classical definition of piezoelectricity, a Greek term for *pressure electricity*, is the generation of electrical polarization in a material in response to a mechanical stress. This phenomenon is known as the direct effect.
Piezoelectric materials also display the converse effect; mechanical deformation upon application of electrical charge or signal. Piezoelectricity is a property of many non-centrosymmetric ceramics, polymers and other biological systems. A subset of piezoelectricity is pyroelectricity, whereby the polarization is a function of temperature. Some pyroelectric materials are ferroelectric, although not all ferroelectrics are pyroelectric.

Ferroelectricity is a property of certain dielectrics, which exhibit a spontaneous electric polarization (separation of the center of positive and negative electric charge, making one side of the crystal positive and the opposite side negative) that can be reversed in direction by the application of an appropriate electric field.

- Piezoelectric polymers
- Magnetostrictors
- Auxetic materials
- Shape memory alloys
- Artificial muscles
- Menotic materials
- Hydrogelic polymers



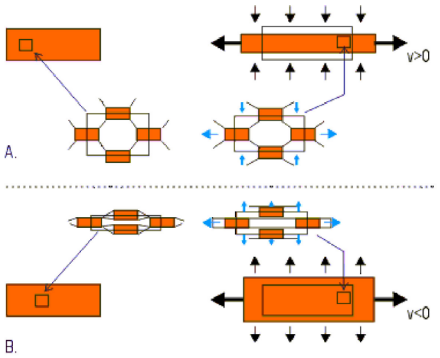
Shape changing Materials

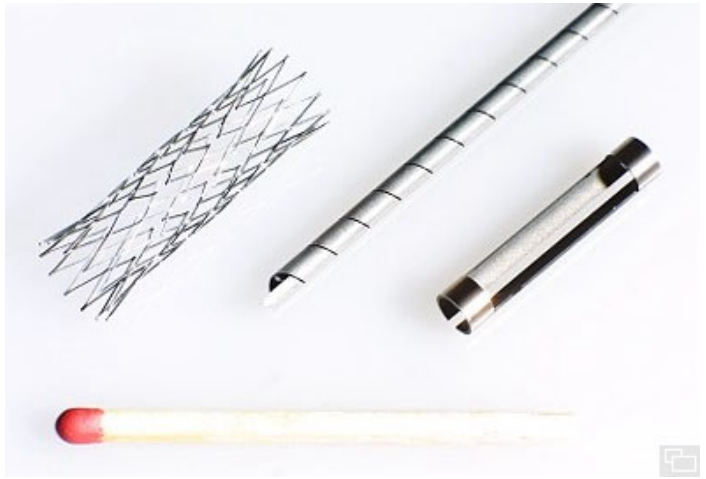
Hydrogelic polymers

Polymer gels

Polymer gels consist of a cross-linked polymer network inflated with a solvent such as water. They have the ability to reversibly swell or shrink (up to 1000 times in volume) due to small changes in their environment (pH, temperature, electric field).
Micro sized gel fibres contract in milliseconds, while thick polymers layers require minutes to react (up to 2 hours or even days). They have high strength and can deliver sizeable stress (approximately equal to that of human muscles).

The most common are polyvinylalcohol (PVA), polyacrylicacid (PAA) and polyacrylonitrile (PAN). Many potential applications (e.g. artificial muscles, robot actuators, adsorbers of toxic chamicals), but presently, few of them have a commercial diffusion.





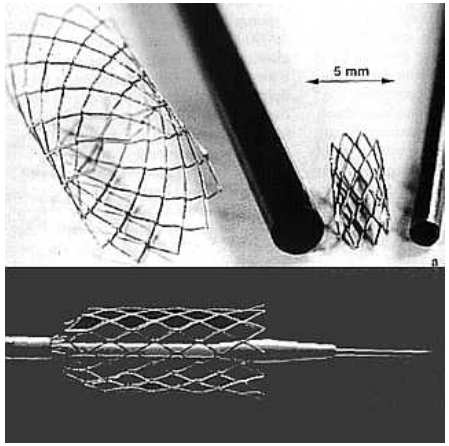
Shape changing Materials

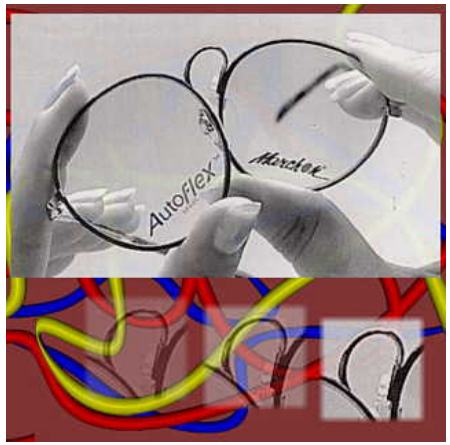
Auxetic materials

Pick up an elastic band and stretch it lengthways as if you were going to ‘ping’ it at somebody. Before letting fly, look at the width of your elongated missile - it’s thinner than an unstretched band, as you’d expect. Try this with an auxetic elastic band and you’d be in for a surprise. These bizarre materials can actually become fatter when stretched, a phenomenon which is now attracting the practical interest of many materials scientists.

A study of the structure of materials, and how it deforms, demonstrates that auxetic properties are entirely feasible. Figure 1 shows a 2D structure consisting of a regular array of rectangular nodules connected by fibrils. Deformation of the structure is by ‘hinging’ of the fibrils. For the ‘open’ geometry shown in figure 1a, the cells elongate along the direction of stretch and contract transversely in response to stretching the network, giving a positive v. However, modify the structure to adopt a ‘re-entrant’ geometry, figure 1b, and the network now undergoes elongation both along and transverse to the direction of applied load. In other words, this is an auxetic structure.auxetic materials show enhanced mechanical properties such as:
increased shear stiffness,increased plane strain fracture toughness,increased indentation resistance which make them superior to classical materials for many practical applications.

Stent for veins
The stent is used for reinforcing weak vein walls and for widening narrow veins.
The chilled stent is brought into position through a probe, and expands to its original size when warmed up to body temperature. The stent replaces similar stainless steel stents that are expanded with a little balloon.



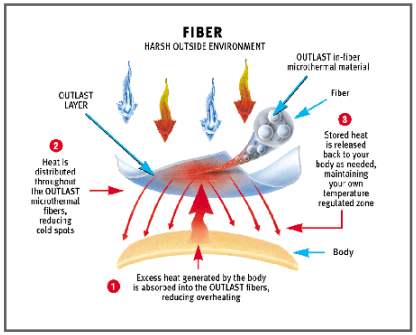


Super elastic glasses
These glasses are made from a super elastic metal alloy. Therefore, they can be bended quite drastically without permanent damage. The glasses utilizes the super elastic property of Ni-Ti alloys.

Shape changing Materials

Shape memory alloys (SMA)

Shape-Memory Alloys are metals that, after being strained, at a certain temperature **revert back to their original shape**. A change in their crystal structure above their transformation temperature causes them to return to their original shape.
SMAs enable large forces (generated when encountering any resistance during their transformation) and large movements actuation, as they can recover large strains.



Composite materials
- Electronic Ink
- Electrotextiles

Transit Information

Electronic Ink

Electronic ink is a proprietary material that is processed into a film for integration into electronic displays. Revolutionary in concept, electronic ink is a straightforward fusion of chemistry, physics and electronics to create this new material. The principal components of electronic ink are millions of tiny microcapsules, about the diameter of a human hair. In one incarnation, each microcapsule contains positively charged white particles and negatively charged black particles suspended in a clear fluid. When a negative electric field is applied, the white particles move to the top of the microcapsule where they become visible to the user. This makes the surface appear white at that spot. At the same time, an opposite electric field pulls the black particles to the bottom of the microcapsules where they are hidden. By reversing this process, the black particles appear at the top of the capsule, which now makes the surface appear dark at that spot.

To form an E Ink electronic display, the ink is printed onto a sheet of plastic film that is laminated to a layer of circuitry. The circuitry forms a pattern of pixels that can then be controlled by a display driver. These microcapsules are suspended in a liquid “carrier medium” allowing them to be printed using existing screen printing processes onto virtually any surface, including glass, plastic, fabric and even paper. Ultimately electronic ink will permit most any surface to become a display, bringing information out of the confines of traditional devices and into the world around us.

- Piezoelectric materials.
- **Active acoustic coating.**

Waves

An active control system consists of sensors, actuators, and electronic control circuits designed to absorb the sound medium and dissipate it in electronic loops. An active acoustic absorbing coating integrates the acoustic sensors and actuators into flexible coating to negate an incident sound wave from reflecting off the acoustic boundary of the submerged object. The concept of active coating is attractive, as it has higher echo reduction, smaller thickness, less material cost.

NEC Empowered by Innovation

Design Examples

Tag

Soft-shell mobile phone.
“Tag” is a new, malleable, casual communicator. It is not only soft but also flexible, for example, it can be hung from a belt or wrapped around the user’s arm. Shape-memorizing material and multiple pressure sensors allow the phone to change its shape according to the mode. The user can also alternate the mode by changing the shape.

Design Examples

NEC Empowered by Innovation

Flacon

Virtual storage bottle.
We already have the means to store a massive amount of images in our various devices, so many that we cannot possibly see them all in a lifetime. “flacon” offers the ways to casually enjoy such a volume of visuals. The images emerge on an inorganic electroluminescent display. Among them, images selected according to anniversaries and the user’s emotions are projected outward through a projector.

Design Examples

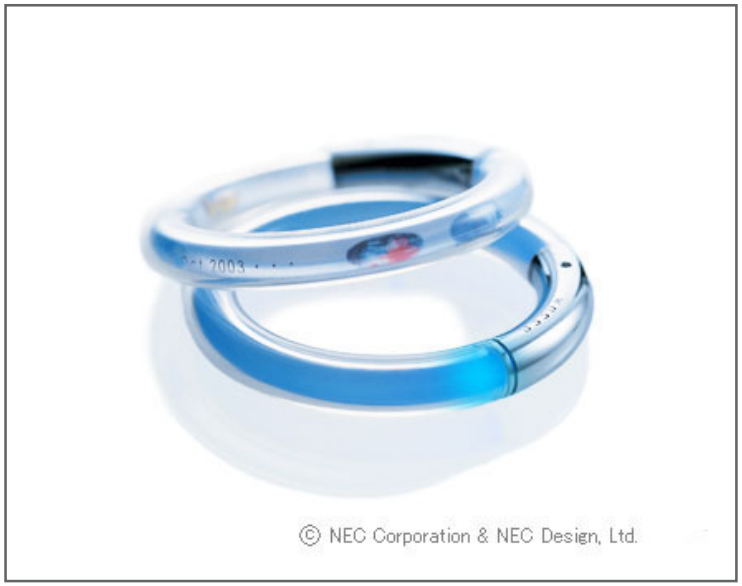
NEC Empowered by Innovation

Duo-pc

A mobile PC with dual displays.
We use our favorite notebook on the desk and in a mobile environment. Then, Why have have more than one PC? Using short-range wireless connection and COG technology, a laptop PC will have more flexibility just like paper.

This mobile PC has a multiple-layer hinge structure that allows users to open it as one large display on the desk and to use it as a tablet PC and a book browser for mobile use. It adapts to users' environments and situations.

Design Examples



Wacca

Visual Memory in a Bracelet.
Just like our memories come alive when we take our favorite objects in our hands, visual memories and their tools should be more closely related. The performance of visual memory devices, such as resolution and memory, will eventually reach their usability saturation points. However, just like wearing wristwatches, they will be worn like accessories rather than highly functional tools.

Looking into the landscape through an opening, this bracelet will capture visual images in the angles adapting to the distance from the viewers' faces through distance sensors installed in the device. Furthermore, users can browse through the visual images on its viewer and also display them just like a picture frame.

Design Examples

Nave

360-Degree Visual Communication Device.

We have seen video phones hundreds of times in movies. However, why can't we act naturally in front of videophone cameras? Conventional visual communications at a distance have been limited due to the display devices and terminals. This terminal enables showing of the surrounding atmosphere and group-to-group communication with a round display and a central super-wide-angle camera.

Phillips

vision of the future

PHILIPS CORPORATE DESIGN

Many products in the home will be cable free offering freedom of movement to the user. Powered by rechargeable batteries, they require recharge bases which are easy to use and fit into the domestic environment in a sypathetic way.
Using induction or direct contact recharging, there could be vases, bowls, mats or surfaces which allow products to be simply placed in or on them to recharge.

Music T-shirts allow you to listen to your favourite music by simply plugging in the attached ear pieces. These shirts are washable garments incorporating miniaturised in-ear speakers and solar cells to provide energy. The technology required is woven into the fabric, making it invisible. The trend toward miniaturised components is allowing many functions to be almost `built in' to our bodies, creating a `second.

Those dollar bills you fold up and stash away are headed, with inexorable certainty, toward cryptographically sealed digital streams, stored on a microchip-loaded 'smart card'.

The ID/credit smart card simplifies the increasingly complex processes of identification and credit transfer. Security for this important information will be provided by technologies such as fingerprint or voice-recognition.

The Interactive Globe uses the attractive qualities of a traditional globe together with an interactive multimedia display, making it easier to understand the interrelations between the world's many systems.The user interacts with the globe by speech and touch. Ask a question or touch the surface and the response is shown on the globe, accompanied by a narration to explain what you are seeing.
The display allows many sorts of information to be shown, such as the world's political systems, the world's languages, the location of natural resources or the time zones. Historical information might include how the continents came to be formed, where dinosaurs lived, where the human race started and how it spread. Linked to a weather service, the Interactive Globe could show the weather around the world at that moment, with clouds moving across the globe. When not in use, the Globe could act as a night-light, showing night and day as it rotates in synchrony with the real globe.

Phillips

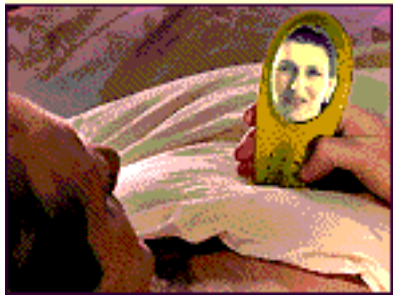
vision of the future

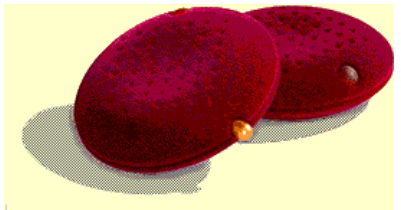
PHILIPS CORPORATE DESIGN

Light can relax, activate, heal, protect, enjoy, stimulate, shape, inform, colour, heat, embrace, strenghen, anaesthesize, hypnotize emotion, hallucinate and guide your body and mind. Artificial light is not about lightbulbs and watts. It's about creating the right ambience for the right occasion.

Light-emitting polymers will evolve to become as flexible as fabric and as thin as paper. Formed or flat, applications in the domestic, mobile, office and public environments will place 'spread' or 'task' lighting on ceilings, walls, floors, or free-hanging. Light plug-ins will allow maximum flexibility in application.

Cushion screen, videophone and loudspeakers
For personal listening and viewing there are small, soft, cushion-like products, such as a screen, a speaker and a videophone. These are all cordless and can be recharged by placing them on the table-top of the Bedroom Heart.





Ivrea - School of Design

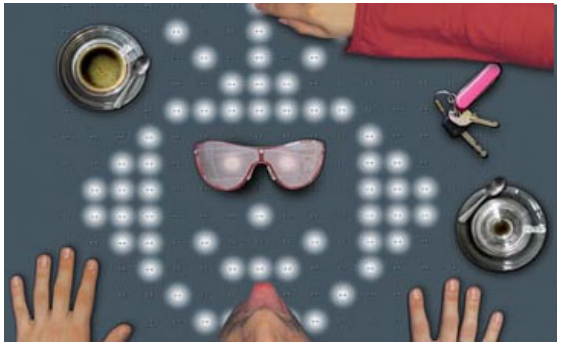
Fluid Switch

Is it possible to design and prototype a soft, fluid switch - a switch that makes us really want to touch it, and that transform a banal everyday gesture into a new sensory experience?
The answer is angelic, a first step towards a world in which the softness of gel is taken from the beauty-preparations counter and put onto our bathroom walls.
Project by: Akemi Tazaki (Japan).

A wall covered with a cloud of 172 plastic hexagons, each of them interactive and reactive. If you move your hand across them, they light up or go out, and the light increases (or decreases) in intensity. It's a wonderful sight!
Project by: Helen Evans (UK) and Heiko Hansen (Germany).

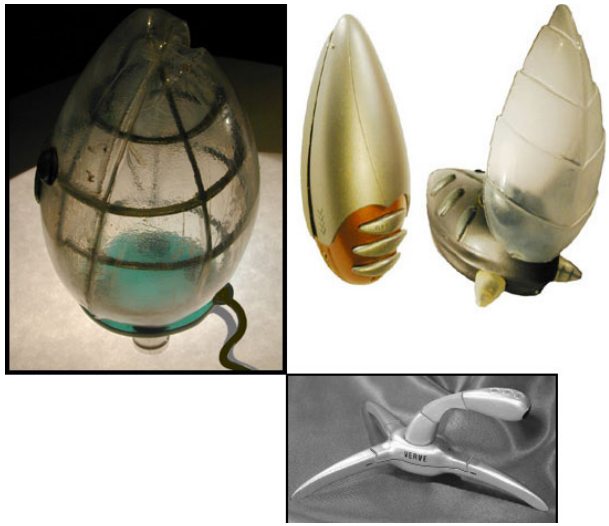
Tableportation - Café tables for virtual seductions

Café tables that light up if you touch them with your hands and that can interact with the other tables in the café, because their surfaces are filmed by TV cameras and projected onto a large screen, showing you a mosaic of images. This has the effect of a subtle, ambiguous game of seduction, where the hands and arms of the customers touch each other virtually, in a magic setting of light and shade.
Project by: Giorgio Olivero (Italy) and Peggy Thoeny (Liechtenstein)



Creative Collision - Artistic "wall-targeting"

Painting digital pictures by throwing rubber pebbles against an inflatable equipped with suitable sensors. The shape and size of the pictures depend on the intensity and the way in which you throw the pebble. The same operation can be repeated several times, using different colours, enabling you to create your own graphic.



Senses.org.uk – An overview

The Centre for Industrial Design at the University of Northumbria is into researching what they call the qualitative sensory performance characteristics in product design (Sensory Attributes) or Sensible Products. Their mission includes to help participatory organizations understand and develop strategic sensory knowledge that can be used to inform the product development process and refine products. This will be achieved by the development of tools and methodologies suited to the measuring, and application, of sensory product attributes.

To develop knowledge and create methodologies which will bridge the gap between recognition of the potential for sensory attributes, to the actual process of linking sensory stimulants to an overall product experience.
The concerns are of ´hard ´ technological possibilities are recognized as key elements of future products, over reliance on its sophistication and ignorance of humanistic attributes will serve to increase any emotional voids between product use and product satisfaction.

They intend to increase the knowledge base by investigating such gaps and charting the awareness of Sensory, Experiential and Emotional characteristics within products and also to investigate the actuality of being able to link such attributes to emotional product experiences.

Inferences from Technological Developments

Skins Become Active

The inventions of dynamic materials and interests shown in active responsive characteristics of a material, exposes us to the tone of the new technological developments. New materials senses heat, changes Colours, deforms, transit information, produces brilliant light, grows, produce electric field, afterglows, detect vibrations unlike the static traditional materials.

These artificially produced materials show various potentials for new product applications. The possibility of making the surface live, active, dynamic gives us a new dimension for designing.

Product surfaces may loose its identity as a passive covering and bring in "that live element" which the skins of nature help us to understand the objects that surround us. The ability of the smart materials to change due to responses would give us an opportunity to look into crafting new ways of using helping in better product communication.

Sensing of Skins

Sensing is defined as any of the faculties by which stimuli from outside or inside the body are received and felt, as the faculties of hearing, sight, smell, touch, taste, and equilibrium. The new surfaces sense external forces and react to it. The sensing ability of surface could directly relate to the sensing ability of us helping greater intuitive or acquired perception or ability to estimate. This would help in imitating nature for our own better understanding of objects that surround us.

Design of Product Skin

The relevance of the new materials in the design of product skins may influence :

The feedback systems- Skin responding to the user while he operates or performs a task (traditional being light indicators and sound indicators)

Indicators – To show the state of performing element in a product. E.g. The life of batteries, the temperature of an iron box

Interactive responders – to play with the surface for fun, to learn the operation

Information containers – surfaces transiting useful information

Dynamic appearance- dynamically changing surfaces designed to induce varying appearances of the product.

Environment observers – to constantly watching environment by reacting to the surrounding.

Design of Product Skin

Serving in FEEDBACKS

Active skins could contribute in better and efficient feedback systems.
Feedback registers the actual state of system, compares it to desired state, and then uses the comparison to correct the state of system. Fast or slow movement is the essence of feedbacks - H F Judson.

Contemporary products contain sophisticated technologies, which is difficult for the user to understand. The user relies on the controls offered to him by the product. These controls are primitively commands to the technology for a particular use. Feedbacks reassure the user during the operations of the controls. Popular traditional feedbacks are sound beeps or sounds, or a light indicator trying to suggest whether the product is on or off, moving, etc. Feedbacks are the essential needs of today's multifunctional products. Feedbacks are performed on the surfaces. Skins could provide vital responses to user while he uses by changing the color, leaving the impression of touch, reminding by vibration etc.

Design of Product Skin

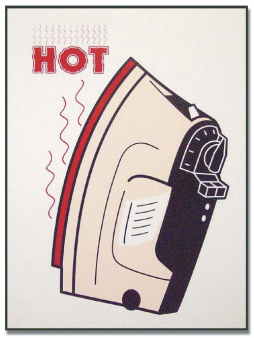
Visible storing and displaying essential data
Essential data referring to various information taking the form of language, numbers and graphics and their displaying abilities on the surface would give a new meaning to the design of product skins. Skins behave as information containers.

Dynamic Interfaces provoking interaction for fun and engagement
Though Skins of nature often show slow responses, either by slow growth, slow change of color, tomorrow's materials are quicker. It takes only a few seconds to change the color of a thermo chromic material. This speed of change will evoke interactive possibilities on the surface making the skin responding to our fancy, hence engaging with the skin.

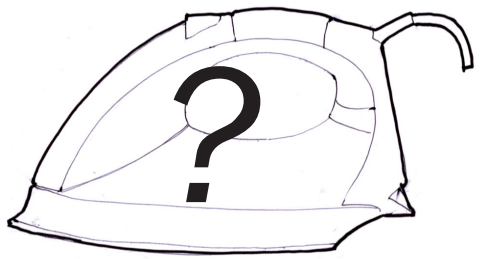
Responding to the environment
New materials respond to nature, to temperature, to sounds, to wind etc. This ability of natural reaction with the environment may create new conscious, more direct and simpler to our environment. Skins responding to surrounding would increase our sensitivity with nature.

Design of Product Skin

Case 1 - Iron



What does a hot iron mean?
Red hot charcoal reminds us of the impact of the heat it carries, or the red hot liquid iron cautions us from its intense heat. The Skin of the molten hot metals naturally gives us feedbacks on the extent, intensity and nature of heat it contains.
What can the iron communicate ?



Design of Product Skin

Information containers
Containing the displays of temperature, mode display, power consumption

Interactive responders
Handle giving the feel of folds of the cloth and the sweep

Environment observers showing the room temperature

Dynamic appearance
Showing the state of the system

Indicating modes like the type of cloth-cotton, woolen, silk

Feedback
By showing the variation of high temperatures

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