

P R O D U C T S K I N

Special project

Anand Asinkar

02613003

Guide

Prof: Suresh Sethi

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Industrial Design Centre

Indian Institute of Technology

Powai, Mumbai 400 076

APPROVAL

The Special project design, entitled
'**Product Skin**' by **Anand Asinkar**, is approved in partial fulfillment
of the requirements of the Masters of Design degree in Industrial
Design

Guide : Prof: Suresh Sethi

Examiner : Prof: Bhandari

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1. The project

Product skin

can also be said as the aesthetic wrapping (or its style) in which the product appears to us. The elements of design such as shape, colour, texture, material and ornament when put together convey the messages which makes one product different from another. The skin is also a trigger for what it makes one product different from another.

The skin is also a trigger for what it makes the object desirable beyond the function. The product can be made into two parts. The actual engineering which makes it work and the appearance which make sit work and the appearance or the cover under which the product functions.

In some cases the product and the skin form a combined function as a whole. The function of the product itself gives it a form.



Identify the fruit shown in
the picture above

Skin in nature

Is skin more than just a physical covering....

Does skin play a role of communication....



Orange

A new dimension, the covering of an orange is the most important property to recognize an orange. The skin when discolored, it is difficult to recognize an orange. The colour triggers the sense of an orange.



For example a gulmohar tree lights up with red fiery flower to earmark the change of season.

Colours and changes in nature ...



A mango is perceived as a raw fruit. It changes its colour when it is ripe. Again skin plays an important role for communication.





Nature is a great source of inspiration for skin. Nature communicates due to the changes in weather conditions. How do we understand it, through physical appearance of nature? Yes, but it is also through the internal changes, that the external appearance of the tree or plants change along with the weather.

The leaves of a mango tree with fresh breed of leaves gives a light orange tinge as compared to the old leaves which are dark in colour.

Nature reacts to the surrounding changes through skin or appearance, changes in temperature or physical changes. We as humans understand it with the change in;

Shedding of leaves

Bearing fruits

Appearance of new leaves(colour)

Change of bark colour (guava tree)

So nature constantly keeps reacting and that itself is the communication through the skin

Skin in nature

Animals have evolved to build a self defense around them through camouflage. May it be a moth or a chameleon. Every creature tries to adopt itself to the surrounding to defend or for secretive offence through changes in the body appearance.

It is done by the changes in body colour. Even though the texture may remain same, but the process is done in two ways; form and colour.

Example:

The chameleon looks like a dry leaf.

The moth looks like a texture on the bark of a tree.

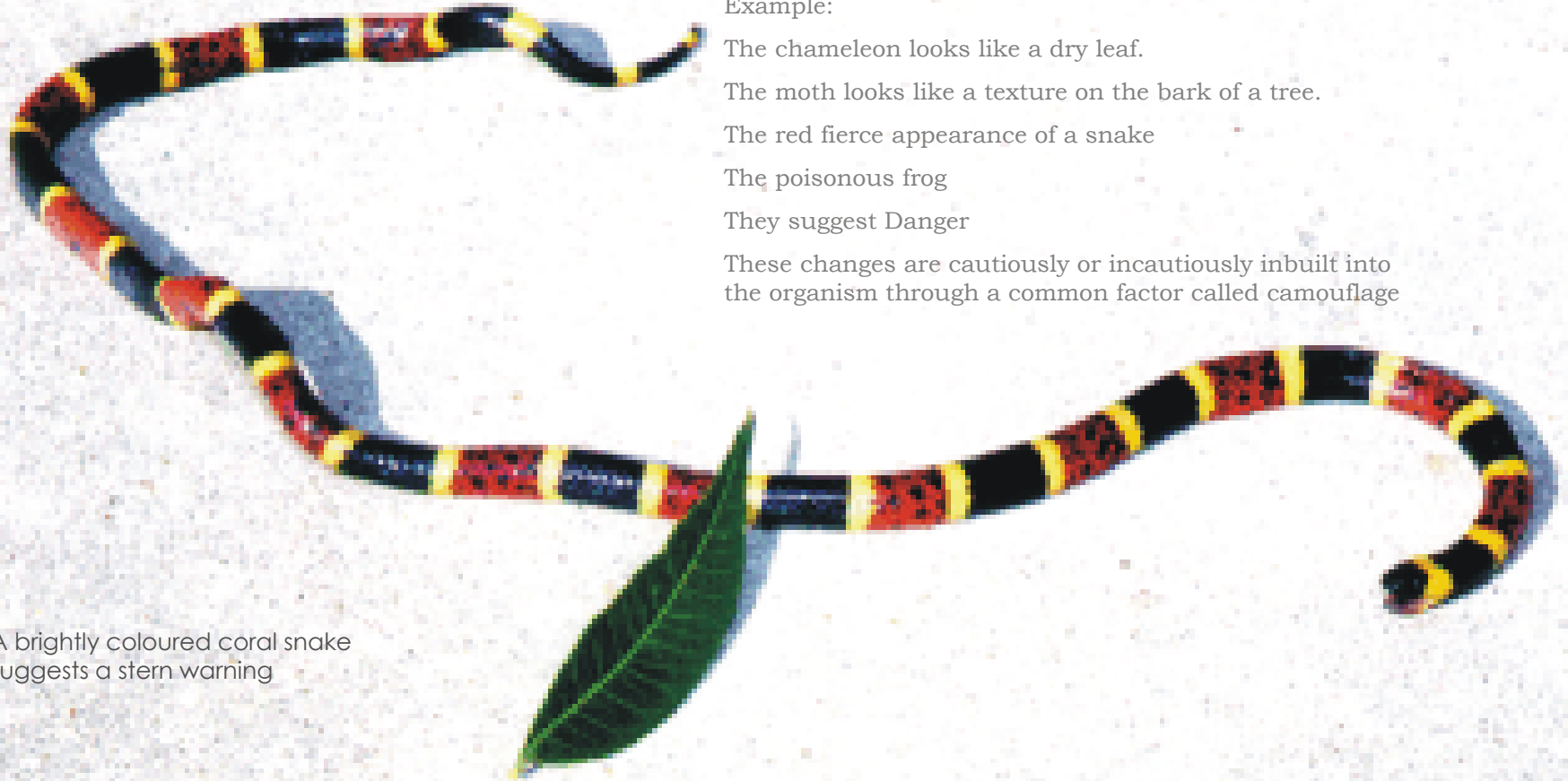
The red fierce appearance of a snake

The poisonous frog

They suggest Danger

These changes are cautiously or incautiously inbuilt into the organism through a common factor called camouflage

A brightly coloured coral snake suggests a stern warning



Groom for
Slim, Fair, Charming

MARATHA GIRL

31/ 165/ 58 B.E.

PROJECT MGR IN I.T

From Mumbai based,
Well educated,
Independently settled,
Hindu boys/ Aged 30- 34
Ph: 9821403873 Email:
mmsin2004@yahoo.co.in

MATCH for fair slim Te-
lugu girl 40/ 5'4" working.
Early marriage. Caste no bar.
Reply with biodata & photo to
Box.No MUM 126609C Times
of India, Mumbai - 400001

V fair B tech SW Engr Sept
74, 5'4" parents Hindi/Vaish,
Marathi/Brahmin. Email:
chandragk@yahoo.co.uk

MATCH for RC Tamil/ Ma-
lyali fly. 26/5'3"/BA Wheatish
wkg. MNC M'bai- glfd boys.
Write Box No. MUM 127065C
Times of India, Mumbai - 1.

The matrimonies which appear in the media.

It seems skin colour has become an important factor to mention for a matrimonial. This shows the human sensitivity towards skin colour. Skin has a clear role to play here.



People

At a different level, the difference in skin colour of people from different regions and places, show difference in skin colour which states their backgrounds or the regional difference, reflecting their culture, geography, food habits,..

But skin is at a different context here at the same time the core function it does is communicate.

Example:

A north Indian has a different skin colour to a south Indian.

So within a small geographical area also the skin communicates lot of information.

Aging is another factor which is directly related to the skin.

The skin itself tells the story behind the person. What the skin does is not only act as a boundary to protect but also a sense, but more than that the nature of the skin that is fresh skin or soft skin or loose skin with lot of serrations show an aged person. A baby skin has a very smooth surface, also it seems very healthy because it is tight along the body.



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Role of skin

From the description, it is seen that skin at different layers does a common function of communication reflecting the contextual changes. The skin clearly states the following functions;

**showing the state of the subject,
showing a relationship with the surrounding,
showing a change with the changes around and
also adaptation.**

Tapping this potential of the covering or skin in nature, the project aims at exploring resources in Industrial products.

2. Scope

The study of skin can venture into various dimensions. Also a same study can be applicable to various areas of application. For example the study of outer covering of a fruit shows the coloring with aging which can be applicable as study of bionics. The study and the application of the skin has been restricted to industrial products.

Relating to industrial products

The skin is looked as a new potential dimension for the design of industrial products. Today industrial products are designed with the shell or the skin keeping in mind in terms of its use as a material in terms of flexibility of form or external appearance which would fit for mass production. But the skin (external shell) gives very much the first impression of a product may it be lifestyle or an electronic product. So keeping skin as a focus, the project aims at exploring as a communication source. Applications of skin in industrial products which are not very complex.



Products today

Technology is what drives the contemporary trends in the appearance of the products. The products, say electronics or consumer goods are functionally the same, but the technology has a great effect in the overall looks. For example, the phone a basic communication device has evolved into a cell phone which are originally communication devices.

The products might vary in shape and sizes like a vacuum cleaner might become more compact or a TV screen keeps bulging but more flattening, so what about the skin or appearance of the object? They more or less look the same. How does a remote control look different from that of a cell phone or a fridge from that of a washing machine. What it means is that the skins of the products remains the same whatever the function.



Types of Product Skins

Products are divided here in categories according to the function with relationship with their external form.

1. Skins to purely as a cover
2. Skin to protect and function
3. Skin as a function in itself



cover



Skins to purely as a cover

In this category, the skins for the products are purely looked upon as a covering for the functional part of the product. The outer shells has a main function of covering the components inside. Their main function is to protect the internal components. For example in a computer, the cabinet of the computer is a hard covering protecting the internal components like the processor and the disk.

The skin also gives a volume to the product. But the skin does not work as a communication media. Communication is done through a different media, it may be through buttons, switches or other feedback media. So the skin as a communication media is not explored here.



Skin as part protect and part function

In this category of products, the skin of the products is part functional and part covering. The skin has two roles to play. The skin itself is a product, but it incorporates the technology or the technology also determines the form of the product. In case of cell phones, the screen and the keypad mostly determines the form. Technology makes it more and more compact, but it cannot reduce after a limit. To further shrink, it had to be made into a split device or something. So the family of the product changes totally.



function



Skin as a function itself

The product skin itself forms the function and the form of the product. The exterior surface encompasses and forms the volume of the product. These products might not be independent functioning of themselves but they are meant to be covering another object. A back pack for example, achieves its form due to the kinds of objects it has to cover. And the size also. here the form and the skin cannot be separated from each other.



aging



time

Skin as a function itself

Another dimension of the skin is the time factor. The environment very much has an effect on the skin of a product. A steel body of an object over a period of time starts rusting. It gives a very different appearance to the product and we say that it is old. Behavior of materials around us make us sensitive to react towards them. So why not use this potential of materials use towards an application.

So its skin is not merely a covering but it also determines the state and life of the product.

So from all this with skin as a focus, these various examples make us perceive the products with another opportunity to design products not merely as functional but also a new ground to design.



personal assistants AIBO



Smart products



In a technological world what man does with technology makes the difference. Smart materials is the innovative solution that fulfils our needs, surprises us and takes our lives in new directions. Making technology have value in our everyday lives is the job of today's designers. Whether a toaster, an aircraft seat, a mobile phone or an item of clothing, we can incorporate complex technology to deliver benefits that enhance our work, play knowledge and learning.

The truth is we don't always want products, we want the results they bring. We don't want an iron, we want non-creased clothes. We want light not a light, and we want to watch a film, not have a TV. We are forced to use these products to achieve these tasks. The design of products can exceed expectation and give joy, upon sight, upon touch or upon use. That delight is the product of design that can deliver what we need but also what we want, or did not even imagine we could have.

Smart products give joy through knowing that it is possible to do things better, by consideration of our needs, wants and emotions, rather than simply our functions.



I Mac computer

Transparency as a new
dimension for products

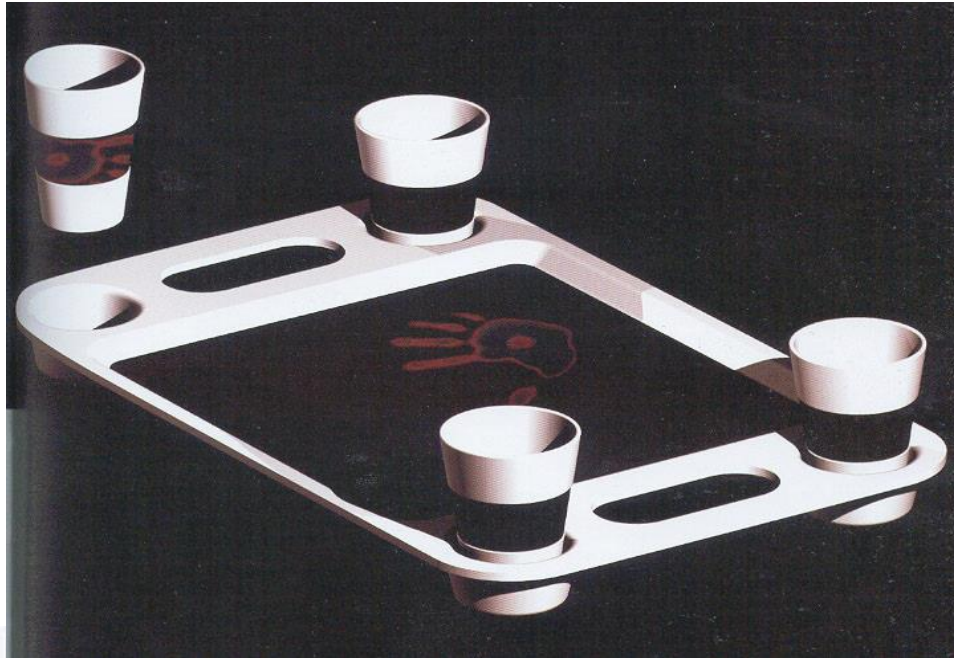
Coffee maker



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Technology

Technology is not just about electronics new materials and processes allow us to have a different and better things. The speed of technological development is now so great that we can do almost anything we imagine and lots we haven't thought of yet. We can ask ourselves what we wish to do rather than what technology might allow us to do. The only shackle to our development is whether we are able to look forward rather than back and address the needs of the future rather than the present.



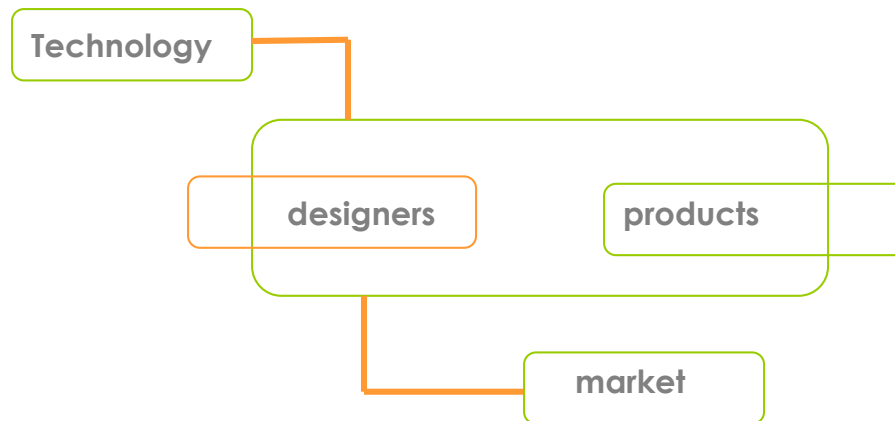
A heat sensitive tray and glasses, which leave a colour impression on products



Changing interface for a car dashboard

Emotion

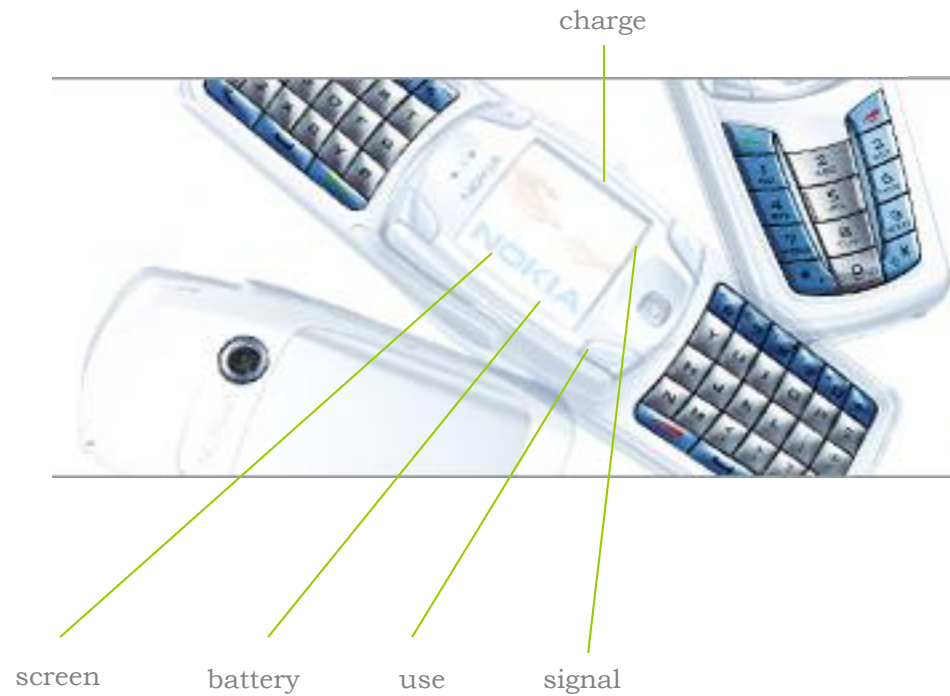
Emotion is a key component of product design, but not which designers are always conscious of. Emotion is about shape, colour, texture and operation and when all these things come together we recognize and appreciate it. Emotion is the most difficult function to achieve because it requires the co-ordination of all the 'soft' and 'hard' aspects of a product, from our tactile response to the physical to our cognitive understanding and ability to control and respond.



Role of a Designer

In a technological world what man does with technology makes a difference. Design is the innovative solution that fulfils our needs and takes us in new directions. Making technology have value in our everyday life is the role of a designer.

He has the responsibility of not only making functional products but also capturing the human emotion. Many products accomplish the task they are required to do. But there are products that grab your attention and make you wonder why do we like them. The products can give much more than what we want and make our mundane tasks more enjoyable. products should give joy through knowing that it is possible to do things better, by considering our needs, wants and emotions, rather than simply functions.



Too much information cramped in..

A cell phone is a product which can be divided into operational and information. The operational part is in response to the information. The display screen is an accumulation of information. A number of information like the call incoming, battery charge, amount of use, signal display and other informations are cramped in a very small display.

The skin in this case can be explored as a medium for information display also.

For example, the skin of the cell phone might decolour due to the loss of charge.

Skin as a communication device ?

Human senses

Industrial products hold a direct relationship with human senses. We respond mainly in two ways viz, Functional and Emotional responses. To perceive a product fully, the human body not only reacts to the emotion, also the product is perceived senses;

Visual

Auditory

Tactile

Taste

Smell

Products are mainly perceived through these three senses viz. visual, auditory and tactile. So these three are only considered here. The interaction mainly takes place through visual and tactile senses.

Here the attempt has been to lay stress on the visual perception of a product. The remaining two are as far as possible tried to be incorporated into more of visual response from the product.

3. Data Collection

What are smart materials?

"**Smart materials**" are a group of materials that belongs to a certain research area. Most of the smart materials are old materials with well known properties. What makes the old materials "smart" is new ways of combining their different properties into new concepts. But the name is used in different contexts and it is also put to discussion of what we mean by "smart material".

"**Smart materials** modify their behavior under specific circumstances, changing their shape, stiffness, position, natural frequency or other mechanical characteristics in response to changes in temperature or electromagnetic field."

"**A smart structure** is one which is capable of responding to its environment, for example, by modifying its stiffness, colour, shape, thermal conductivity, or position depending upon external parameters. Smart structures involve intimately embedded sensors to monitor these external parameters, adaptive intelligence to interpret the data from the sensor array and embedded actuators which, through the necessary control system, provide the appropriate structural response."

Materials

Products need not be plastic or wood or metal. Computers need not be gray and opaque. Products can be allowed to wear out, like an ancient travel trunk and take on new forms as you use them. What happens to your product at the end of its life is not important and could affect how we feel about ownership and disposability, if throwing away means rejuvenation through recycling rather than disposal and waste.

Our preconception that products are about functionality and everything else is ephemeral has repressed the design.

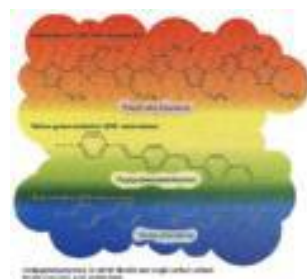
1.Photochromic materials

Photochromic materials change reversibly colour with changes in light intensity.

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.

Producing a plastic that can emit light would have seemed outlandish just two or three years ago. Even the idea that plastics can conduct electricity comes as a surprise to most people. After all, plastics are familiar as insulating sheaths round wires and as the casings around all manner of electrical appliances. But in the mid-1970s, a group of scientists discovered that plastics do not have to be insulators, when they stumbled across a polymer that behaved as a semiconductor. This discovery opened up the prospect of materials that might combine the electrical properties of metals with the ease of processing and versatility that have made plastics a runaway success over the past half-century.



Photochromic plastics have millions of molecules of substances such as silver chloride or silver halide embedded in them. The molecules are transparent to visible light in the absence of UV light, which is normal for artificial lighting. But when exposed to UV rays, as in direct sunlight, the molecules undergo a chemical process that causes them to change shape. The new molecular structure absorbs portions of the visible light, causing the lenses to darken. The number of molecules that change shape varies with the intensity of the UV rays. When you go indoors and out of the UV light, a different chemical reaction takes place. The absence of the UV radiation causes the molecules to "snap back" to their original shape, resulting in the loss of their light absorbing properties. In both directions, the entire process happens very rapidly.

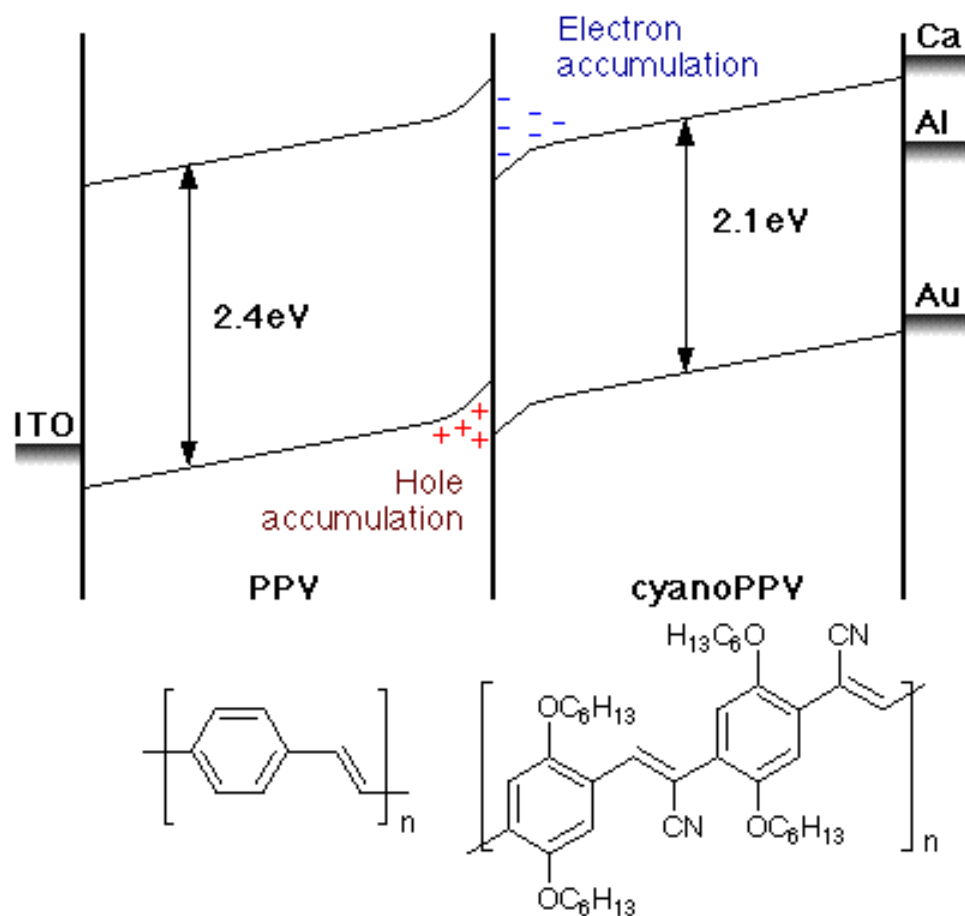
Polymer Light Emitting Diodes (PLEDs)

Polyphenylene vinylene (PPV) was found to emit yellow-green light when sandwiched between a pair of electrodes. The initial device efficiencies were very low, but the researchers quickly realised the commercial potential of this discovery, especially for the manufacture of displays which emit their own light. These would offer significant advantages over the main display technology we still use today (liquid crystal display or LCD), in which a separate light source has to be filtered in several stages to produce the image we see.

PLEDs have a number of intrinsic advantages over liquid crystal devices:

- PLED is an *emissive* technology: it emits light as a function of its electrical operation.
- A PLED display consists of polymer material manufactured on a substrate of glass or plastic, and does not require additional elements such as backlights, filters and polarizers.
- PLED technology is very energy efficient and lends itself to the creation of ultra-thin lighting displays that will operate at lower voltages.

The resulting [benefits](#) include brighter, clearer displays with viewing angles approaching 180 degrees; simpler construction resulting in cheaper, more robust display modules, and fast response times allowing full colour video pictures even at low temperature.

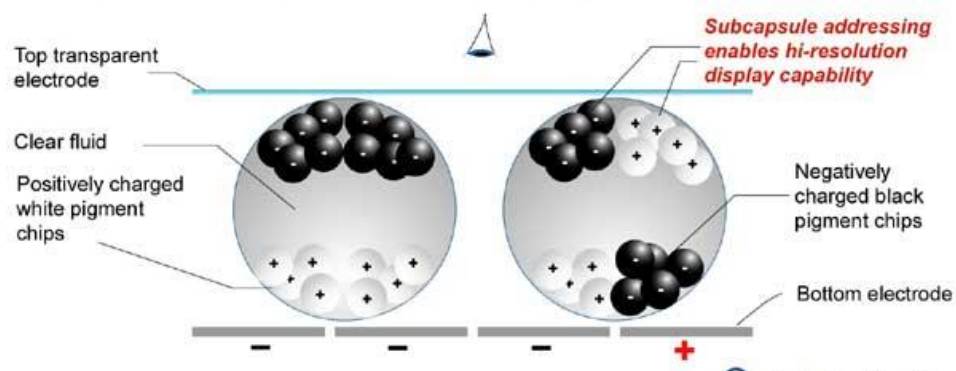


The basic principle of operation of polymer light emitting diodes, or PLEDs, is as follows:

1. An amorphous film of the PLED material is sandwiched between two metallic electrodes forming the anode and cathode on a transparent substrate
2. Electronic charges are injected into the polymer from the electrodes: electrons from the cathode, and 'holes' from the anode
3. The electrons and holes 'capture each other' through electrostatic interaction
4. Radiative recombination of electron and hole generates light
5. The wavelength of this emitted light depends on the band gap of the polymer used.

PLEDs can be used to produce light of a very wide range of wavelengths - including light outside the visible range - by modifying the precise structure of the polymer used. Internal device efficiencies have been improved by modifying the polymer material to be more or less electron withdrawing and therefore to have higher or lower electron affinity.

Cross-Section of Electronic-Ink Microcapsules

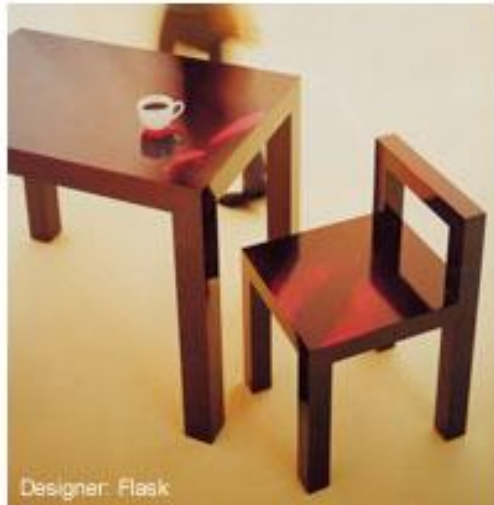


2. Materials that change colour due to heat

Thermo chromatic / Electronic ink

Electronic ink is a proprietary material that is processed into a film for integration into electronic displays. 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.

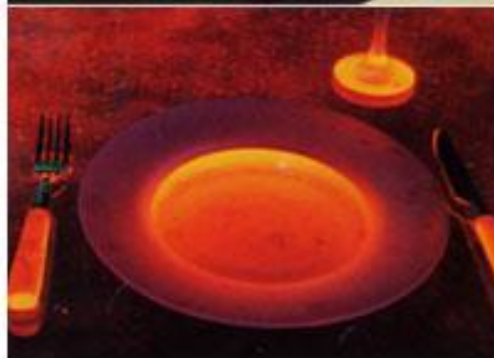
To form an E Ink electronic display, the ink is printed onto a sheet of plastic film that is laminated to a layer of circuitry. The circuitry forms a pattern of pixels that can then be controlled by a display driver. These microcapsules are suspended in a liquid "carrier medium" allowing them to be printed 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.



Designer: Flask



Designer: Suzikami + Thomas Garner



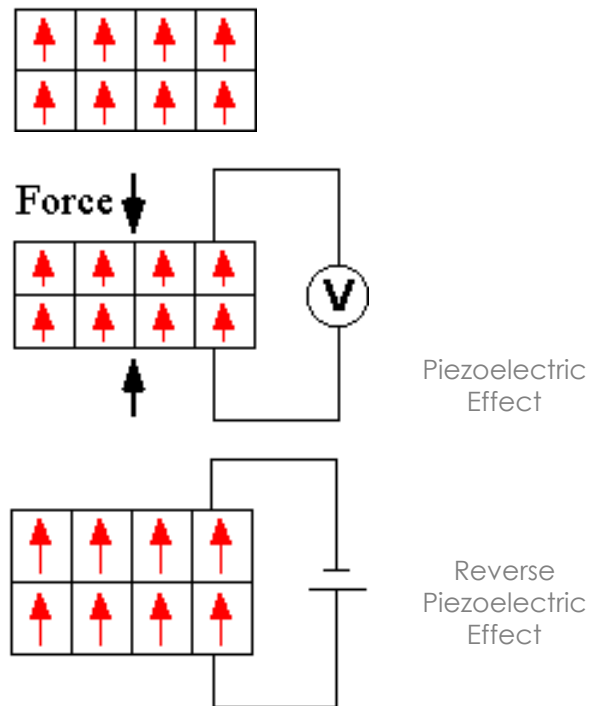
Designer:
Jürgen Mayer H.

Applications of heat sensitive inks

A tea set, that has clear cups which turn bright pink when cold water is poured in so that the cup appears to be filling up with coloured liquid. The effect is caused by heat-sensitive inks embedded in the cup's inside surface.

Tan which uses the same technology as light-sensitive sunglasses. The plastic used in the doll reacts to ultraviolet rays so that it develops a 'tan' after 10 minutes in the sun, and fades again out of the light

Transformer toys that incorporate 'light-edged plastic'. In these, the plastic absorbs light on its surface but transmits it along its edges, making the Transformer glow



3. Piezoelectric materials – materials that change shape

Many polymers, ceramics, and molecules such as water are permanently polarized: some parts of the molecule are positively charged, while other parts of the molecule are negatively charged. When an electric field is applied to these materials, these polarized molecules will align themselves with the electric field, resulting in induced dipoles within the molecular or crystal structure of the material.

Furthermore, a permanently-polarized material such as quartz (SiO_2) or barium titanate (BaTiO_3) will produce an electric field when the material changes dimensions as a result of an imposed mechanical force. These materials are piezoelectric, and this phenomenon is known as the piezoelectric effect.

Conversely, an applied electric field can cause a piezoelectric material to change dimensions. This phenomenon is known as electrostriction, or the reverse piezoelectric effect.

Piezoelectric materials

Piezoelectric devices are used for measuring waves, movement, etc. But it can also be used in reverse, e.g. damping vibrations, making sound.

All piezoelectric materials flex and move when an electric current passes through them. When a current fluctuates at audio frequencies through a polymer film of piezoelectric material, it vibrates like the diaphragm of a loudspeaker.

Piezoelectric materials are used in acoustic transducers, which convert acoustic (sound) waves into electric fields, and electric fields into acoustic waves. Transducers are found in telephones, stereo music systems, and musical instruments such as [guitars](#) and drums.

Quartz, a piezoelectric material, is often found in clocks and watches. An oscillating electric field makes the quartz crystal resonate at its natural frequency. The vibrations of this frequency are counted and are used to keep the clock or watch on time.

A manufacturer has recently embedded piezoelectric materials in [skis](#) in order to damp out the vibrations of the skis and help keep the ski edges in contact with the snow.



Examples



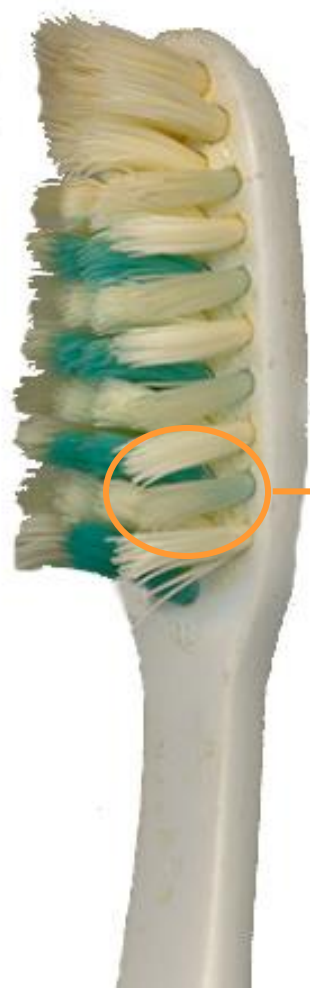
Photo chromatic material

A common example is light sensitive glasses. The glass is light sensitive. It starts changing into dark colour as soon as it comes in contact with bright light. This glass is called photo chromatic glass.



Photo chromatic watch

The dial of a colour changing wrist watch is essentially a photochromatic material. This material with the changes in the light intensity, changes the colour of the dial of the watch. These products do not let the mundanity remain throughout its use, but creates a responsive play with the change in the environment.



Oral-B toothbrush

The oral-B toothbrush where the bristle group is marked, starts decolouring. It starts converting from the blue colour on alternate bristles to colour in white. This shows that the brush is loosing its efficiency and needs to be disposed. This way the brush also communicates more than just the use of the product.



Thermo chromatic thermometer

This is the most commonly used thermometer, especially for young children. The heat sensitive film reacts and changes colour according to the amount of heat transferred when kept on the forehead. The colours in a particular region exactly tell us the body temperature. Another advantage of this is, it takes just 15 seconds to get the reading for the temperature

Applications



Possible applications in Products

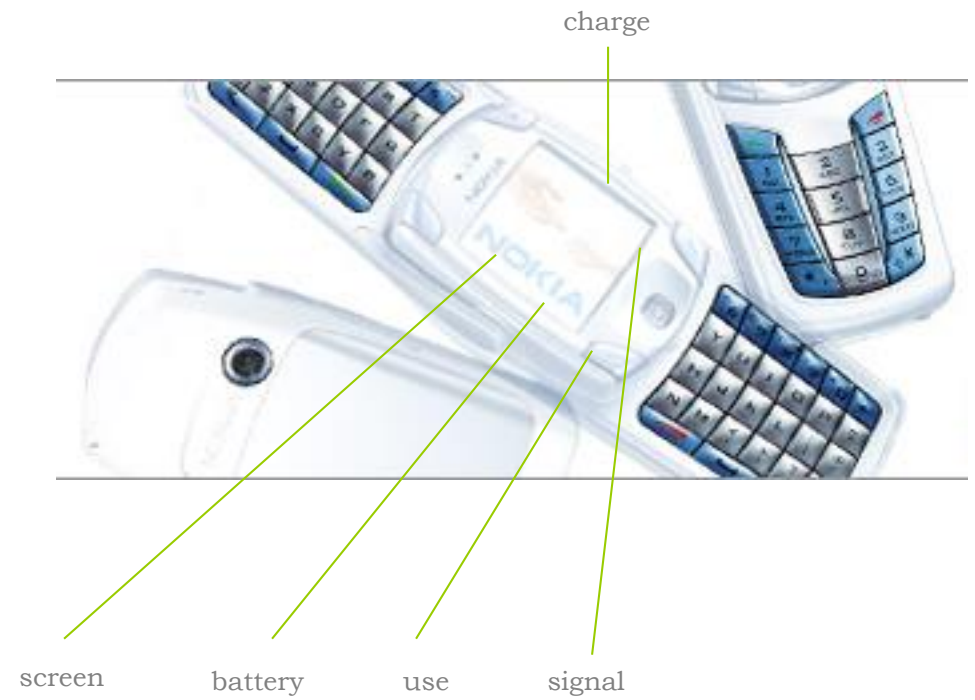
A mug which changes its colour as the tea inside gets colder

A battery Charger

The battery itself does not indicate how much it is charged. So therefore a display panel on the charger which changes colour as the battery gets charged.



Too much information in too little space



Possible Solution to the problem

Here what is shown is a simulation of a cell phone.

The body of a phone is of such a specific material that it fades away with the losing battery power. The body can be battery powered or it can be a smart material. The idea is to communicate the state of the battery just by looking at the cell phone. This way the keypad need not be locked nor the screen be back lit nor occupancy of display area on the communication screen.

What is shown here in 3 stages is;

1. Phone when fully charged
2. Intermediate stage
3. Very low charge
4. Discharged.



Stage 1



Stage 2



Stage 3



Stage 4

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Appendix

NEC corporation and NEC design

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.

NEC corporation and NEC design



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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.



NEC corporation and NEC design



Gumi

Ubiquitous media chip.

In this service proposal, RFID chips hold the usage rights to images and music available on the network. The chips are covered in a gummy capsule, and are edible after use. When the play unit is connected to the container, the basic unit, it can be used as an audio player. By setting it in the cradle connected to the display through wireless LAN, users can also enjoy visual contents. The chips are sold in packages just like candies. Blank chips on which users can allocate data will also be available.



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NEC corporation and NEC design

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.



NEC corporation and NEC design



P-ISM

A Pen-style Personal Networking Gadget Package

It seems that information terminals are infinitely getting smaller. However, we will continue to manipulate them with our hands for now. We have visualized the connection between the latest technology and the human, in a form of a pen. P-ISM is a gadget package including five functions: a pen-style cellular phone with a handwriting data input function, virtual keyboard, a very small projector, camera scanner, and personal ID key with cashless pass function. P-ISMs are connected with one another through short-range wireless technology. The whole set is also connected to the Internet through the cellular phone function. This personal gadget in a minimalistic pen style enables the ultimate ubiquitous computing.



NEC corporation and NEC design

duo-pc:

A mobile PC with dual displays.

We use our favorite notebook on the desk and in a mobile environment. Then, why do we have to 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.

duo-phone:

A cellular phone with dual displays.

"duo-phone" is installed with a detachable display, which enables users to enjoy a videophone in a more natural manner, and a photo sensor adapting the next-generation barcode. It is a next-generation cellular telephone that can be also used as a "duo-pc" mouse and remote control.