From Chronograph to Valuegraph - Deconstructing the DNA of a luxury watch through manipulative copying:

A formal-aesthetic and product semantic excursion through Copyland. *[by Oliver Neuland - July 2011]*

Back in the 1970s and early 80s, for the general public desktop computers were far from simply a commodity. Type setting and photo-lithography, the base for 'real' printing (off-set or lead-based), were still expensive and remained in the domain of the professionals. In most offices, however, there were photocopiers. These were considered advanced machinery enabling everyone to desk-top-publish (DTP) flyers, fanzines and small newspapers. Amateur designers were sticking photos and typed text on paper and merging them through photocopying. Typically, the outcome was a document with messy layout, black-and-white, rough and high in contrast print quality. The photocopier caused a foreshock in graphic design before the tsunami, in the form of desktop computing, wiped out entire parts of the industry. These low-tech machines (photocopier) enabled many to play with type and images, often ignoring the traditional rules of layout and print. Later David Carson and Nevil Brody utilised these amateurish attempts and underground experiments (see 'Punk' and 'Grunge') in their work, finally resulting in graphic design traditions of a professional level.

Fig.1 Photocopied flyer for the Danceterie, New York, 1983

To achieve or emphasise the special look of such photocopied artwork, images were purposely copied several times to distort and alienate them even further. With white tip-ex and a black marker, the results were in many cases cleaned up and manipulated, helping keep coincidence and ambiguity 'on the right track'. In most cases the goal of such a process was to get from a crisp, highly detailed colour or greyscale photograph to an abstract graphic illustration; everything that was not essential to the main image and did not communicate the intended image, was erased.

Fig.2 'Ray Gun' magazine cover 1992 by David Carson adapting the rough-and-dirty copy culture.

The aesthetic of these photocopies carried on the traditional techniques of paper cutting, screen printing and 'drop and dipping' (A. Warhol), which had been around for some time. However, through the medium of the photocopier, it was suddenly easy for 'common people' to achieve similar outcomes. Without having many graphic or drawing skills, they could easily abstract or posturize a realistic image (the original), and by adding some typed text, create a reproducible artwork. Today we find several filters in photo editing software (like Photoshop) which simulate these processes of creating abstraction or distortion in 2D.

Fig.3 Andy Warhol screen print artwork 'Elvis Presley' 1962 - The image of Elvis was originally from a PR still for the film 'Flaming Star' (1960, Twentieth Century Fox)

After observing the huge evolutional steps in three-dimensional design tools and digital reproduction, and having used the described photocopying techniques himself in the past, Oliver Neuland, Industrial design

Senior lecturer at Massey University, asked himself "What happens if one applies the same copy process in 3D?"

When Neuland worked in the automotive industry he had already been exposed to the use of 3D scanners for clay models (Reverse engineering) and rapid prototypers for building proportion-, presentation- and data-control models. That was, however, in the 90s, when the prices for such machines where still astronomical. These machines radically changed the way vehicles were developed. Now, with a radical drop in price, these technologies suddenly seem available to the general public, once again making room for experimentation at all levels of experience and professionalism. They open up the opportunity for everyone to experiment with copying and pasting in the three dimensional space. Therefore, the question about applying the former photocopying techniques to 3D becomes relevant, since in the same way as the photocopier some 40 years ago, today we seem on the verge of almost every office having a 3D printer – and many amateurs already starting to play with them.

Open source RP machines like the RapMan, Up-printer or Makerbot, affordable 3D-scanners like NextEngine or cacked web-cams (as well as game consoles) combined with software like DAVID (David Vision Systems), Axon/Skeinforge, Netfab engine, as well as Blender, TinkerCAD or Google SketchUp, create packages which enable almost everyone to scan, print and manipulate objects repeatedly. Web-based services like Shapeways.com and Ponoko.com help to achieve the idea of a personal 'fabrication lab' for everyone, just as Neil Gershenfeld of MIT promotes it. The former Kinko copyshop manager, Mark Hutch, offers high-tech workshops for Silicon Valleys creatives in a fitness club like model called '*Techshop*'. Inventors join and can use Laser cutters, CNC devices and other toys to build their dreams (see Brandeins 03/2011, pp68). The philosopher, Peter Sloterdijk, critically announced the 'epoch of self-design of the masses' ("Epoche des massenhaften self-designings" *See Choudhry, P., Form237/2011, Birkhaeuser, Basel, pp.84*). Many designers also support the 'open design' movement.

"The rise of Open Design is closely connected with the Internet, which has expanded the possibilities to express and share creativity tremendously. Millions of people build websites, edit pictures or post clips on YouTube. This do-it-yourself-culture is now crossing over to the physical world." *[Junte, J., 2010, 'Open Design is not a clear-cut ideology, but it has different manifestations' retrieved 9.4.2011 from* www.waag.org/download/76541*]*

In this environment, Neuland wondered how rapid manufacturing (aka. *Additive Manufacturing*) would change our perception of original and copy; how randomised and de-constructivist copy processes would affect the three-dimensional design space; and if these techniques could be utilised for a purposeful

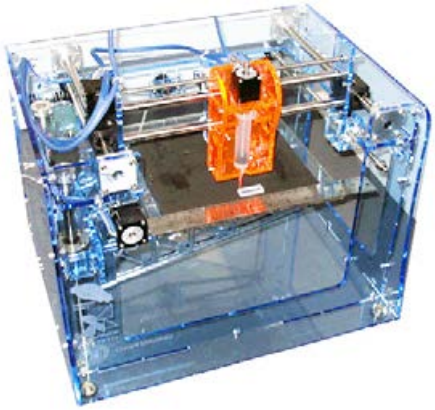

Fig.4 Low cost 3D printer 'Fabber' Model I from Fab@Home for self assembly

Fig.5 Generative Design:, 'Lounge Landscape', Design: N. Burggraf, S. Hoffmann, S. Reichert, N. Reinhardt, Project at HfG Offenbach, 2007

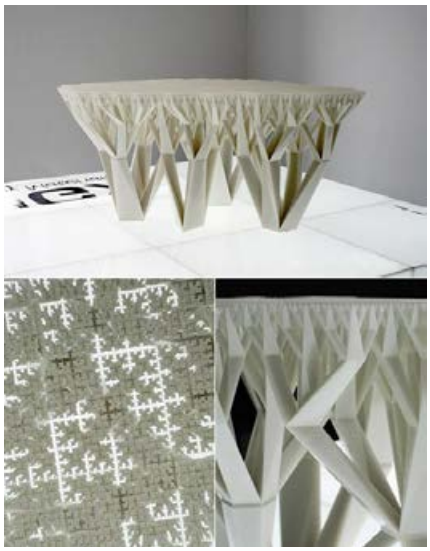

Fig.6 "Fractal Table is a table which derives from studies into fractal growth patterns (…).Fractal Table, developed by Platform Wertel Oberfell together with Matthias Bär, is impossible to manufacture unless rapid prototyped. The table is a single piece SLA made in epoxy resin."

shape generation of three-dimensional objects, which has been done in other areas of so called 'generative design'. (This is a field of experimental design in which mathematical equations are often in combination with new technologies, or randomised analogue techniques are utilised with the result of strange and quirky, but sometimes impressively beautiful designs. See for example: www.materialise-mgx.com; www.digital-identities.com; www.jorislaarman.com; www.theverymany.com; Weizeneggers Sound vases; Prof. Peter Raab student experiments at FH Coburg). Transferring the photocopy image process into 3D therefore seems an interesting experimental path from several angles.
Clearly the fast results and high reproduction rate of photocopying would not be achievable with 3D printers (or more precisely 'additive manufacturing machines') because of the time it takes to produce such a copy and 3D scan it again. However, the idea of creating something new by distorting or manipulating it through copying seems similar.

Fig.7 'Original' Rolex 'Submariner' in solid gold with automatic mechanical clockwork - still useful as a status symbol and fashion accessory without watch function. In this case the commonly used term 'original' refers to a legal reproduction (or 'original copy').

First, a suitable object had to be defined to base the experiments on. Neuland considered drift wood or other objects collected from nature, which lead to some related experimental projects. However, in the eyes of humans natural objects are already inaccurate and to a certain extent random. Therefore, for this experiment a smaller, artificial, man-made product seemed more suitable. The accuracy and 'un-natural' shape-language of such an original would make the difference to the distorted outcome more visible and hopefully very different from the input Also the simple fact of price, related to volume, for each scan and 3D print, limited the range of objects from an economical point of view. The suitable product for the experiment seemed to be a wristwatch, not only because of its size and formal-aesthetic accuracy, but also because of its interesting product semantic.

The industrial design lecturer had used the case of luxury wristwatches regularly in class to question the simplified and often thoughtless use of the quote "*form follows function*" by explaining the inherent complex relationship between 'practical functions', 'formal-aesthetic functions', 'signal functions' [Affordance] and 'symbolic functions' of products. These terms are part of the 'Offenbacher Ansatz - Theorie der Produktsprache' [Offenbach Approach - Theory of product language] developed in the1970s at HfG Offenbach, Germany, by Buerdeck, Fischer, Gros, and Mankau. The theory tried to determine different functional layers of objects beyond the practical use. In the declining heydays of functionalistic design and architecture the former HfG Ulm graduates tried to explain that there is not only one kind of function to follow, but a whole set of partly contradicting functions within a product. These depend not only on physical and production laws, but on cultural, technical and

Fig.8 Luxury watch advertising emphasising the product's function as a fashion item and replacing the 'aura' of the original with the creation of 'personality' to reflect back on the reproduced object (copy).

aesthetic heritage and imprinting, personal experience as well as social context of the user/recipient.

Depending on the initially defined aims, certain functions have to be traded off for others to achieve the best suitable result (see Nigel Cross's Theory about matching problem-solution pairs in design). Consequently there is not one '*good form'* ['*Die gute Form*' or '*optimum solution'*] for a function (and product), as functionalists often tried to make us believe, but there is in fact an endless array depending on the level of importance of different functions in relation to their context. So, if for example an element of surprise is aimed for in a product because this is highly valued in a certain milieu or market, it might be less self-explanatory in its design (without making it a bad designed solution). Sometimes practical functions are sacrificed for formal-aesthetic if the product is meant rather for representation than for actual everyday use (e.g. formal clothing vs. work- or sportswear).

In this construct of ideas wristwatches, especially luxury ones, can be seen as extreme samples where the practical function (telling users the time) can be almost erased without making the object useless. This is because certain watches are a fashion accessory or a means of displaying social status and belonging rather than a time measuring device. (Just flick through a current issue of Vogue, GQ or Wallpaper with its many adverts for expensive watches to find proof) This shift of core function applies even more now since mobile phones (also status symbols) cover the time function for most users.

With this in mind, the idea arose to go to the extreme and give these users the functions they actually want: a watch that displays its high value to those around them, and which has easy-to-read symbolic and formal-aesthetic stereotypes of luxury. Neuland at this stage did not intend to conduct quantifiable market research on luxury watches in general, but trough his investigations and the need to interpret them for his individual design outcome, he made some interesting observations which are shared. As the aim was to evaluate 'manipulative copying' as a design tool and to create a design solution reflecting his personal view on the topic 'luxury watch', as well as copying within design, the stated observations and conclusions are personal and to a certain extend biased. But that is how design and art work. There is no neutral standpoint or ultimate truth.

One of the stereotypes observed is related to the material used. In general, it seemed that all luxury watches are made of precious metals. Gold seemed to be the first choice. It is culturally seen as 'the most valuable' material (whether or not this is fact) used in fairytales and modern treasure hunting stories alike. Gold is also a world currency and safe-haven for investors in rough economic times. Combined with oil,

Fig.9 Red Baron with comrades in April 1917 during WW1. Due to his track record of air strikes he was an admired and feared 'Hasardeur' which became a mythical figure.

Fig.10 Stock market as the new 'war room' and 'holy grail' to fast wealth and status. Brokers are their alchemists. Seconds make or lose them millions; they are today's 'Hasardeurs', condemned and admired alike.

Fig.11 Rolex print advertising from1969. Exclusive water sports are linked to their luxury brand and products.

the noble metal is one of the economic key values closely monitored on the commodity stock market in real time around the world. So, linking real-time to value growth in such a luxury product was a logical step. It would not only provide a sense of time through the changing value on the display, but also link the user to the fast paced and globalized world of stock brokers. Despite the last economic crisis this is still an almost mystic subculture of financial power and fast wealth. Even though their actions are often ethical questionable or plain criminal stock brokers seem secretly admired '*Hasardeurs*' [germ. = fearless or reckless risk taker] in the way pilots like the *'Red Baron'* [Rittmeister Baron Manfred von Richthofen] or Howard Hughes were. This might be a reason why so many classic luxury watches have some flight navigation functions, even though 99% of all users seem to have not the slightest clue how to use them. Due to this fact these cryptic numbers and dials are rather ornamental carrying symbolic function. Another inspiration for such functional ornaments are sailing and diving applications. In the eyes of many people they relate to a highly desirable world of luxury in tropical resorts and exclusive marinas – which is by far more thrilling and adventurous than stiff and aristocratic 'old-money' clubs.

With wireless technology available and wristwatch mobile phones on the market it was realistic to assume that such a watch could display the value of its built-in gold component in real time, including the stock market it collects data from. (With an 8 hour shift from one to the next trading location around the world this would at least indicate time to a minimal extent.) Frankfurt (EURO), New York (Dollar US) and Tokyo (Yen) were identified as the three stock markets, time zones and currencies displayed in this experimental product called 'Valuegraph'. Based on the term 'chronograph' used for mechanic watches, the 'Valuegraph' would display real-time value and use a mechanical display component to link back to traditional mechanic Swiss and German luxury watches like Rolex, TagHeuer, IWC, Breitling, Lange & Soehne, Glashuette, Pateck Philip, Omega and Meistersinger.

There is another important facet which makes the watch an interesting object to work with in the context of coping. Today Neuland sees the idea of 'copy' and 'original' more as a virtual than a physical fact.

Due to its symbolic function, certain watches are a constant target for product piracy and imitation. Year by year millions of 'fake' watches (and other items) are produced and destroyed despite functioning perfectly. We often forget that they are only produced because of market demand! Many people do not hesitate to wear fakes (or rip-offs) in order to be linked to the image of the 'original' (or rather 'genuine') luxury item. This works well because it is often rather difficult to

Fig.12 Wristwatch with integrated mobile phone. Swarovski crystals try to give the impression of high value and luxury while the consumer product look of the main watch body sends a different message.

Fig. 13 Simon Oosterdijk went to the extreme of erasing the watch entirely from the wristband and making it a bracelet and fashion accessory; it is more rough and technical than luxurious looking.

Fig.14 Watch wrist band produced by the user of a Makerbot 3D printer. Does manufacturing at home become reality?

tell from a distance if the object is a so called 'original' or 'fake'. So despite being a copy, these products still fulfil their symbolic function in most environments, which is somehow ironic considering our cultural heritage and obsession with the original created by and accredited to individuals.

Before carrying on discussing the issue of copies and originals it might be useful to note that Neuland sees two types of 'original':

A. The 'original artefact' which is a unique object made by the creator/artist. Such an artefact (or performance) Walter Benjamin insinuates with 'Aura' in his famous, but very politically biased essay *"The work of art in the age of mechanical reproduction"*. For him '*Aura*' relates to an object's '*substantive duration*' and to its "*testimony to the history which it has experienced*", which rests on its authenticity. This historic testimony and authenticity seems mainly determined by the direct presence and physical contact of the creator during creation, as a mechanically reproduced object can also gather historic testimony after its creation is complete, which we might call 'patina' and/or product history.

B. The 'original idea/concept' which then leads to a product or work of art. This facet of the 'original' is purely virtual, not physical.

Even though many would expect it, both do not always come together, as an original idea/concept can either lead to an original artefact or something we could call a '*legal reproduction*' or '*original copy*' – which sounds paradoxical if you think about it. The legal use of original design ideas from a third party can occur in certain circumstances when used as a citation or caricature. Usually the original has to be well renowned and the referencing creator tries to communicate a new or alternative standpoint by also altering the idea/object slightly to make his point. Being copied is a proof for the relevance of the original, not only in the case of a citation, but also in a typical case of plain plagiarism.'

Since the industrial age the theoretical idea of an 'original' artefact (which in the design context seemed to be derived from fine arts experience where one would see an original painting, drawing or sculpture which could then be copied) became rather blurry or even obsolete, considering that almost every industrially manufactured product is a copy or replication anyway. So, many objects in our daily life are no longer original artefacts, but only an original idea/concept with an array of direct legal replications (copies). (Jochen Gros talks about "*the product as a built or materialized sketch*" *See: 'Das Produkt als gebaute Skizze', Gros, J., 2000*)

Walter Benjamin indicated such a reaction on mechanic reproduction when discussing photography:

Fig.15 'Couture Replicas' is one of many sites selling replicas and design-inspired luxury goods. The name tries to indicate exclusivity within the copy-market; Rolex copies seem to be top seller.

Fig.16 World famous painting for a long period of time assigned to Rembrandt van Rijn seems to be the work of one of his students. Is the style of Rembrandt and his initial idea for the painting the original (idea/concept)? Does it matter who executed the final artefact?

Fig. 17 Citations or caricatures of original artefact were always common practise in art and design. Is ~~this a copy or original artefact in its own right?~~

"*From a photographic negative, for example, one can make any number of prints; to ask for the "authentic" [or original] print makes no sense.*" (Germ: *"Von der photographischen Platte z.B. ist eine Vielheit von Abzuegen moeglich; die Frage nach dem echten Abzug hat keinen Sinn.*" *[Benjamin, W., Das Kunstwerk in Zeiten der technischen Reproduzierbarkeit – Fassung 3., 1938].*) So, what we see today is often a copy from a virtual original.

Now think of rapid prototyping where an original concept can be converted into a unique (one-off) artefact and working product. Neuland wonders: Does such an object have aura Is it an original artefact? What happens if it is not created from a blank piece of paper, but based on data collected from the physical environment through 3D scanning?

In western societies being the creator of an original idea is highly valued, whereas copying, while improving the initial idea, concept or quality of the artefact seems to be depreciated. This also shows in the fact that wearing or owning a so called 'original' is a status symbol in its own right. Observing our society one could bluntly state that the original seems for the rich and successful, while the copy seems for the less successful masses and the poor. Think about it: mass production and the creation of identical copies was not invented for aristocracy. That's why Benjamin does not seem to shed a tear over the changes triggered by mechanical reproduction as it gives the masses access to what was before restricted to a small elitist circle.

Neuland assumes that the high social value of being the creator of an original is based on the evolutionary philosophy: ***'society progress through parallel variety'***. Naming, rewarding and protecting the individual inventor/creator is an incentive system which helps to promote several competing solutions, each parallel developed to a very refined state.
Contrary to this philosophy, other societies (namely Asians) seem to follow a ***'society progress through linear evolution'***. In such a world of thinking, an idea/concept does not need to be assigned to and owned by one inventor, but is free to be copied in order to improve the result at every new evolutional step, free for the whole society not just a few (see Open source). Instead of many highly protected and advanced concepts competing with each other for a limited market, in this school of thought the most successful option is adopted by many earlier on and refined by creative copying (See Asian car and motorbike industry).

In this setting, reaching mastership through copying the master is seen as a good thing. In such a value system it might be less important if Rembrandt or one of his students has painted a painting, as it would still be a masterpiece and valuable contribution to the society's art evolution. In the western approach the painting becomes almost worthless, despite evident mastership.

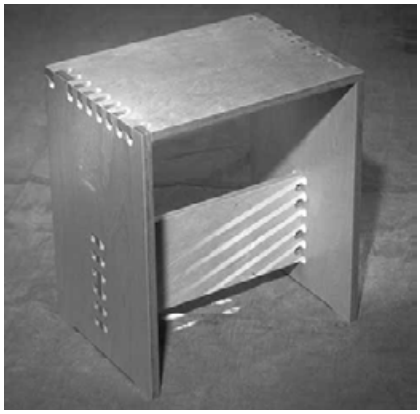

Fig.18 Jochen Gros re-designed Max Bills famous 'Ulmer Hocker,' an icon of functionalistic design (education). The citation is used to discuss a fundamental shift in design through computer numeric fabrication techniques. Is this a rip-off or original copy of a new idea/ concept?

Fig.19 'Bootleg Object #B0.01:Rebraun' by Markus Bader & Max Wolf, 2002-3. Ironic citation of the functionalistic icon 'Braun Audio Kompakt1'

Fig. 20 Ronen Kadushins 'Open Design' metal watch holder - photographed with a fake watch (which he has not re-designed or reproduced!). Blueprint for reproduction is free to download for non-commercial users.

With the Open source movement, however, this alternative world of thinking suddenly gained relevance also in western societies – Digital data, Internet, DYI machines and share-ware were their fuel. The designer Ronen Kadushin proclaims *"Enter the open source method, one that revolutionised the software industry, created a viable economy, and gave birth to a flourishing social movement that is community-minded, highly creative and inclusive."* *[Kadushin, R., Open Design Manifesto, Berlin, 2010, http://www.ronen-kadushin.com]* He shares the 'Open Design' approach with the dutch design studio, Droog Design (www.droog.com/projects/events/design-for-download), and many others around the world. What Jochen Gros of HfG Offenbach has foreseen with his blueprint ideas [see 'New Craft' & 'C-Moebel'] in the early 90s has now become reality. People started to offer their design ideas as downloadable blueprints, not as finished artefacts or products. Thingiverse.com is one of these fast growing new platforms which invite people not only to copy data and original ideas, but to make them better and give back to the community. (It might be interesting to note that innovation researches have found that the innovator might gain more respect, but even in western markets the imitators usually make 98% of the profit on new inventions, sometimes to the extent that the imitator is actually seen as the creator of the original, as in the case of Apple or others. *[Willenbrock, H. (2011), Warum ist es besser Zweiter zu sein, Brandeins 1/2011, Hamburg, pp.16-17]*)

Fig. 21 'Custom made furniture project' by Haren Ryan. New original artefact made out of original copy parts

It is not only an 'open-source'/ 'open design' environment that challenges the idea of the original (idea/concept) owned by individuals, but digital data distribution, data availability and their easy processing create a state of 'IP vacuum' in certain areas of art and design.

Once an artefact is digitalised it also becomes a subject of conversion through 'manipulative copying'. We can observe the issues of such trends clearly in music (sampling) and photography. Today the question can be asked 'How much one does have to manipulate images, three-dimensional shape arrangements or sound arrangements so that they become the manipulator's own creation (and IP)?' This is a question Neuland also wanted to research in the 3D environment with this project.

If we go back to the sample of photography for a moment, one could even go a step further and wonder whether non-arranged photographic images and blank studio shots of objects can even be virtual 'originals' (ideas/concepts); they basically ('only') copy what already exists in reality. Cameras are basically copy machines with a restricted capability of manipulation. Therefore the IP on a non-arranged photograph and blank studio shots of objects seem to protect only a few virtual factors like position in space, position in time and camera settings; nothing more is protected, as the actual physical forms depicted (and setting in

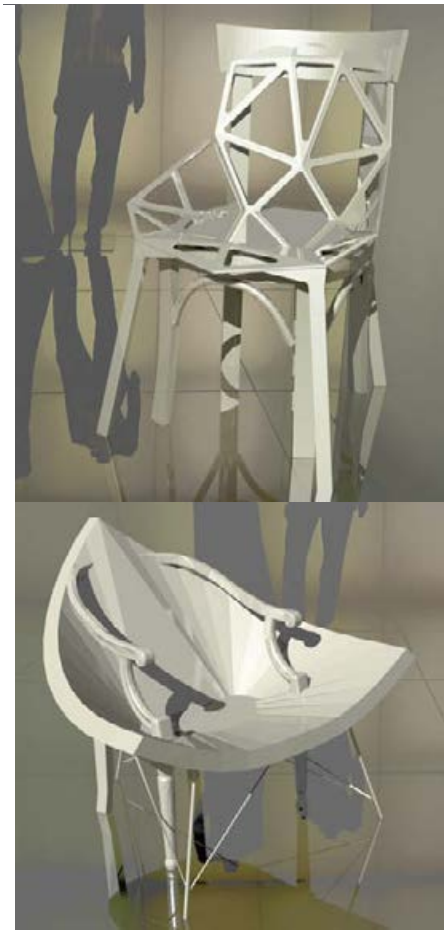

Fig.22 'Crash chair project' by Oliver Neuland, 2010 Attempt to create new original artefacts from virtual copies (replications) of furniture classics sourced through the web-based Google sketch-up library. Digital files of contrary products are merged in the virtual environment (like in the movie, 'The fly'). The physical object would be created via Rapid manufacturing and casting techniques.

time and space in case of non-studio shots) were in most cases created by external factors such as nature, passers-by, architects, designers, engineers, artists and others. So, options for a photographer to influence or manipulate reality – especially since digital photography – are camera settings and omitting context. Neuland wondered how this is different from making a 3D copy of an object, and 'just' changing the colour or colour saturation and altering the context in which it is presented. Currently this would clearly be a violation of IP rights if the object would be an industrial product or artefact. And don't try to play the skill card. Copying (a product/artwork) can require as much skill and process knowledge as creating an original artefact.

As to be expected, there other views, as presented in the MOMA exhibition *"The Original Copy" (Note the title itself!).* The show presented in 2010 in New York discussed the photography of art sculptures and argued that converting the original artefact/artwork from one medium (physical) to another (photographic image) made it an independent work of art. So, Neuland wondered: Is converting an original idea or artefact into another medium, and obviously manipulating it slightly though the process, enough to make it an 'original' in its own right? Before you photographers nod, think about this scenario: someone records a street musician in the subway with his mobile phone. Obviously the recording device, position and setting of the recorder will alter the input, but is this recording an independent artefact and is the recording person the owner of the IP on this piece of work? Clearly, this can be argued.

In a globalized and outsourced market strange things happen, which also questions original and copy. It can become rather ridiculous in cases when the same assembly line (in Asia or elsewhere) produces products with the same tools, materials and components, which are only different in their branding (or non-branding, making them so called 'No-name' products), and then sold for radically different prices because a little sticker accolades them as an 'original (copy)' or not.

When Andy Warhol copied and replicated common pop culture images in his work instead of painting, sculpturing or photographing himself, he challenged the common idea of a skilfully artist-produced, original and unique work of art. Still today the concept of an *'original art print'* sounds somehow paradoxical to many. The artists Duchamp [Urinal 'Fountain', 1917], Beuss ['unnamed - Badewanne', 1960] and Koons went even further and confused and agitated the art world with 'ready-mades'. Duchamp, aware of this, even photographed his sculptures and "*produced 'authorized "original" copies,' blurring the boundaries between unique artwork, readymade, and multiple." [From the article 'Marcel Duchamp: The Readymade as Reproduction', The Original Copy, Exhibition at Moma, NY, 2010]* When Koons declared 4 brand new, mass produced, off-the-shelf vacuum cleaners from

Fig.23 Jeff Koons's 'New Hoover convertible' project from 1980, declaring brand new, off the shelf vacuum cleaner pieces of art. Converting legal copies into original artefacts – or just taking the piss on the self-centre, money driven and want-to-be-exclusive art world?

Fig.24 'Real fake watch' of artist Liao Yibai. The artist plays with original and fake luxury products in his art. "Liao Yibai describes some of the symbols used in his sculptures as being taken from the Chinese 'Fake Makers', who simply copy the shape and logo of a popular product from a magazine and subsequently integrate a new fake into the Chinese market"

Fig. 25 Wow, 'Genuine fake watches'! – Do they help to promote the original brands and the general stereotype of a luxury watch? Does this then lead to incest of shapes?

Hoover ['New Hoover Convertibles', 1955], objects of art, and therefore valuable original artefacts, he not only caricatured and criticised modern art, but played with the idea of converting a copy into a valuable original (only affordable to rich collectors).

A similar approach was followed in the 'Valuegraph' project. Neuland wondered if it would be possible to take an existing 'original copy' (product) or by-the-original copy-inspired-copy (so called 'design inspired', copycat or 'me-too', but not a 100% imitation) and through manipulative and generative copying, make it a new 'original artefact' (2nd, 3rd… generations) in its own right? Would the targeted users even discover (and understand) the irony in converting a disdained, cheap object for the masses into a prestigious, luxury item for the rich and successful?

When discussing art and mechanical reproduction, Benjamin also predicted a shift from the artefact as a 'cult object' (instruments of magic or sacral rituals rarely displayed in public) towards an 'exhibition object', easier to access and perceive publicly. He hoped, through this secularisation of art objects, art could also become a more democratic and political tool. Today we have to wonder if this became reality. For fine arts it can be doubted (it seems more elitist, but politically more uninfluential), since even visual communication design appears to be used mainly for selling goods and creating a 'personality' around them. This is something which the philosopher observed as an attempt to replace the missing 'Aura" in artificially reproduced artefacts.

Looking at consumer goods in general and luxury watches in particular, it seems as if 'Aura' is a homeopathic, almost placebo, drug compared to the force 'personality' (through branding) unleashes in the modern society. Moreover, luxury watches and many other products in our daily lives, perceived as 'original' or 'authentic', become both an 'exhibition object' and a sacrad 'cult object'! (Not surprising in an environment where belief in a 'higher spirit' aka. God has for many shifted towards a belief in Materialism.) Again, the question can be asked, 'Where does the turning point lie between a manipulated and an original copy becoming a cult object for the user and an exhibition object?

"Marx decreed that in the industrialized, capitalist world, human beings become ever more objectified while consumer objects, 'commodity fetishes' become the focus of our desires." *(Polhemus, T., 1999, The Art of the Motorcycle, Guggenheim Museum, New York, pp.57)*

Let's get back to the start of the project. It was kicked off by simply photocopying an object to posterize and distort it like was done in the past. Surprisingly it

Fig.26 Indian bracelet inspired by a Casio digital watch – obviously a desirable item. Gold finish indicates the high symbolic value.

Fig.27 Devindh's concept watch reduces the time information to a cryptic graphic element on the margins of a golden bracelet in watch form.

Fig.28 The growing number of cryptic time display concepts in watches indicates their shift from being a precise measuring tool to a fashion accessory. Sample of Tokyoflash Japan website.

turned out that digital copiers delivered slightly different results to the traditional analogue machines from the 20th century. The latter's digital scanning and printing process with too many options for defining input and output, resulted in a grey pulp of dots rather than a crisp (or hard) black and white image. It turned out that the attempt to improve the technology for perfect document reproduction, made them less useful for experimental (or artistic) types of work. The direct unfiltered electrostatic copy has nowadays been replaced with a process which runs a digital scan through several buffers and filters to print via laser. **So, what was meant to be an improvement turned out to be a step back for the medium photocopy as an art and design tool**. Therefore it would be easier today to imitate former analogue photocopying results by utilising digital image filters like '*Posterize*' rather than contemporary machines. (Funny, that!)

You will notice that the first photocopy tests were conducted with a digital watch from Casio, the 'Illuminator'. It should be mentioned that the first scanned object was a fake Casio 'Illuminator' (yes, even such a thing exists!) bought on a street market in Damascus, Syria. At this stage of the project, Neuland planned to shift a watch from the lowest level in the value hierarchy to the extreme top of the luxury market. The original Casio comes with a hidden social code – being the 'anti-poser watch'. This is a product that refuses to play the status definition game and to say as little as possible about the user (even though this is not possible) "*One cannot not communicate*." (See: Watzlawicks first axiom of communication – *Watzlawick, P., Beavin-Bavelas, J., Jackson, D. 1967. Some Tentative Axioms of Communication. In Pragmatics of Human Communication - A Study of Interactional Patterns, Pathologies and Paradoxes. W. W. Norton, New York]*). These old-school watches are perceived as a pure utility item with some sentimental value for people who went to school in the 70s and early 80s (or are into the 80s retro wave) when these products were new and exciting, and a status symbol for 8-12 year olds in classrooms around the globe. (Evidence for this is the fact that many DJs and urban hipsters wear golden Casio remakes today. One can even find golden Casio-like bracelets for kids from India!)

However, it turned out that the photocopied shape was geometrically too simple and did not produce the wished for results; after the first scan no significant features were left which referred back to the original Casio product. It could be expected that no interesting distortion would come out of this original copy. Apart from these practical considerations during the process it became clear that users/buyers might not build a 'sacral-like' relationship to such a simplified object as the formal-aesthetic would be too simple, whereas the recoding of its symbolic function would be too complex. (This will be explained in more detail below.)

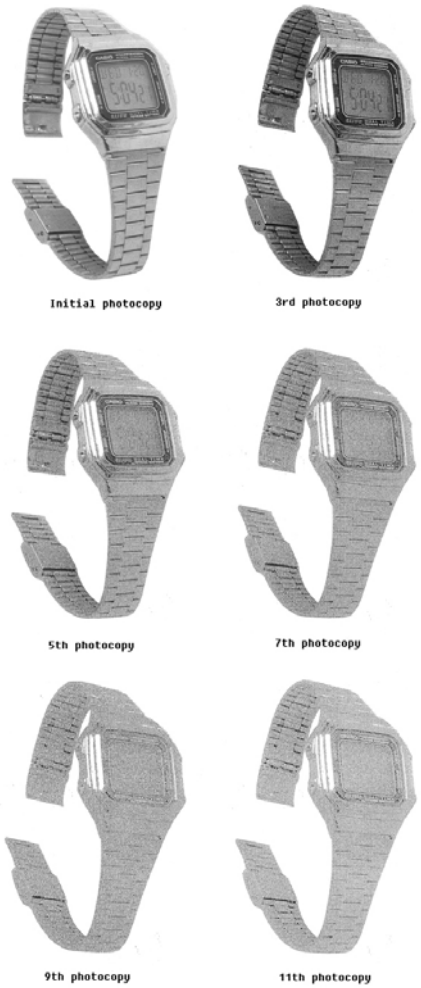

Fig.29 Initial 2D photocopy experiments with the image of a Casio digital watch on an hp digital copier. Results differ slightly from the use of analogue copy machines as scanning and processing technologies are different. Digital machines seem to produce 'point pulp' rather than posterized images.

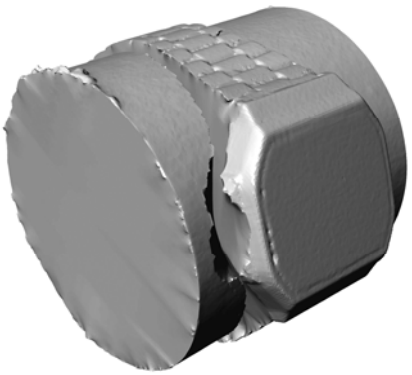

Fig.30 3D scan of fake Casio watch mounted on cardboard cylinder scanned with Roland LPX drum scanner. Surfaces in 'shadow' are automatically filled by software.

So Neuland decided to work with fakes or 'me-too' products already influenced by the formal aesthetic language of luxury watches. Creating a luxury object and original artefact from an initial mass produced and also imitated object for the poor seemed logical, as it represented the simplified and condensed formal-aesthetic idea of luxury in this market (in a way already the 2nd generation). It also maintained the ironic twist of a value change (from low to high on the scale) and could potentially become a neat little act of vengeance to the clueless status symbol and 'must-posses-the-original' devotees.

However, first a luxury product had to be identified which is perceived as 'authentic' or 'genuine' (like the Rolex 'Submariner' or 'Datejust'). Surprisingly, during the web-based market investigations for a suitable original, it was found that even serious and well established manufacturers have very similarly designed products in their portfolio, which often makes it hard to determine where an original design idea starts and a copy/imitation ends. While producing an unauthorised identical copy (at least of the outer shape/geometry and branding) is illegal, because it is protected by intellectual property laws, many watches sit on the margin of being heavily 'inspired' by other original ideas/concepts. With this tendency the luxury watch market (like many others) also seems to work in an area where the question occurs 'How much does the original idea/concept have to be manipulated to become a new original instead of remaining a copy?' At first glance this seems to be similar to the earlier issue described within photography, but in this case it is more a question of good or bad symbolic functionality.

Despite the fact that designers and watch makers prove their scope of new and innovative ideas for the wristwatch regularly, the users seem to have a very refined idea of what traditional luxury watches should look like – limiting room for variety. Meeting the expectations of a well conditioned audience, through advertising and social as well as historic imprinting (germ.: '*Praegung*'), seems to limit the formal-aesthetic repertoire of such products. Personal and collective experiences and expectations as well as several technical, functional and usability restrictions seem to force this market to a certain degree of self-repetition – or incest. This is clearly a downside of the above approach: *'society progress through linear evolution'*. However, one has to bear in mind that many of these original concepts/ideas for luxury watches came from a craft background, not from industrial designers. In a very limited number of regions, with a high density of watchmakers, the skills, secrets and patterns were handed down from one generation to the next. Blueprints and build patterns are traditionally shared and inherited in crafts instead of each individual craftsman trying desperately to create new ideas from scratch (or re-inventing the wheel). In many fields we gain from this attitude of 'experience builds on

Fig.31 Different interfaces for displaying the watch's value on a Casio inspired copy. Ideas generated with research assistant & industrial design graduate, Josh Puno.

experience' rather than 'individuality and uniqueness at any cost', for example in building crafts like carpentry or joinery. Through patent laws western society also acknowledges that successful ideas have to be made accessible and handed down to a wider range of users and producers. This is the reason why patents run out/expire after 20 years – giving the inventor enough time to make a profit on their initial effort put into a new invention.

There is another facet to copied products. Since the presenter of an original copy needs to exhibit the object of desire to an informed audience (see above: shift to exhibition object), the incest of shapes on the lower end of the value scale seems to imprint upon and educate the recipient as much as the surrounding advertising and PR for the original concept/brand. **So the copy seems to make the original even more desirable and helps to consolidate a stereotype which is than even harder to break out of!**

It might be interesting to note that users often send contradicting messages when it comes to this kind of formal-aesthetic incest. Take cars for example. Many users complain that cars nowadays all look the same – an incorrect and blunt generalisation on the behalf of untrained recipients. On the other hand car manufactures find that the same people are rather conservative when it comes to voting with their chequebooks. This is a constant disappointment for designers who often see their innovative ideas collecting dust in drawers because they did not match the collective expectations or archetypes held in the buyers' minds.

During the search for rip-offs in bric à brac and one-dollar shops, luckily Neuland found it hard to actually find a one-to-one copy of the previously selected (original) watch. So instead of using an one-to-one like easily found in Indonesia or Thailand he came across many products which seemed to be a hybrid (or bastard) of commonly known watches like Omega 'Seamaster', Rolex 'Submariner', Rolex 'Datejust', TagHeuer 'Aquaracer', Breitling 'Navitimer' and others. These hybrids are far more interesting for design research as they mixi different characteristic features into an eclectic representation of the general idea of a luxury watch (at least of the outer shape, but not so much their quality or inner mechanic precision). The strategy seemed on the one hand to help to avoid IP issues, but on the other to cement collective expectations and therefore promote the incest of shapes even more.
Overlapping or repetitive patterns and features in similar products seem to form a dense archetype cloud in the mind of recipients sharing the same social and cultural '*horizon*'. *(See: Burdeck, B., ‚Design: Geschichte, Theorie und Praxis der Produktgestaltung', Birkhaeuser, Basel, 2005).* In this regard, the 'imitating' or 'design inspired' objects seem to filter features to a core. Neuland found that they

Fig.32 Rolex Daytona 145. The inner graphic of the display of the scanned watch was inspired by this model. The outer shape referred to a Rolex Submariner.

Fig.33 This low cost hybrid was scanned and re-printed. The watch is heavily inspired by a Rolex Submariner on the outside and Rolex Daytona on the inner graphic layout. To a certain extent the plagiarists condensed their idea of a luxury watch through their selection of 'flinders' (germ. Versatzstück). (The grey colour remained from scanning)

allow gathering more insight about formal-aesthetic features, which support to a certain symbolic function, than the original watches themselves. So do fakes in a way help to 'posterize' the general idea of luxury watches? Their creators are – if they do not just replicate every detail – the ones with 'tip-ex and black marker' who clean up the noise; just like the results of photocopying machines in the past.

That was what Neuland was after, a product which could already be seen as an physical archetype cloud (in the photocopying analogy this would be a already slightly posterized original). He found a design inspired hybrid for his experiments. The outer features were clearly from a 'Submariner' (Neuland identified this model as the most referred to in his search), the display however was more inspired by a Rolex 'Daytona' or Omega 'Speedmaster'.

Like all classic watches, this watch was made from metal (in this case stainless steal, even though gold plating would have been more appropriate). The general proportions are rather bold and solid, making it a male model. The forms are additive and derive from rather simple geometric shapes but show a slight curvature on their surfaces (making them curvy but not puffy) – elegant and slightly dynamic rather than too functionalistic-dry or over-minimalistic trendy. The surface transitions are relatively hard edged or faceted without being razor-sharp, indicating a certain degree of precision (however here the low quality became visible in the fact that is was less crisp and a bit washed, not precise). Like many in this category, the watch is quite rich and dense in its features (like three sub-dials in the lower centre); this clearly shows a traditional understanding of luxury in the sense of '*more is more*'. Showing off many secondary features, which in traditional watch making related to a high number of manufacturing hours and mechanical skill, still seems to be a sign of wealth and opulence for many. It appears as though they're saying 'Hey, I can afford to invest in things which are very high up on the Maslow pyramid of needs (or better still, not necessary for survival)!'

Using an analogue display with classic modern typography, very fine spacing and index needles, refers back to mechanic time measuring. A rotating ring/dial with embossed numbers on the outside is more a reference to diving/sailing than an actual functional tool. The chain-like metal wristband supports the richness of forms and creates a classic crafted pattern look. An unscrewable back plate with tool position indents tries to indicate a mechanical nature and option for maintenance (despite the fact that this model is priced as a disposable product). With these features, the watch captured most of what the majority of users would expect in a stereotypical classic luxury watch, apart from diamond trimming; this is often seen in

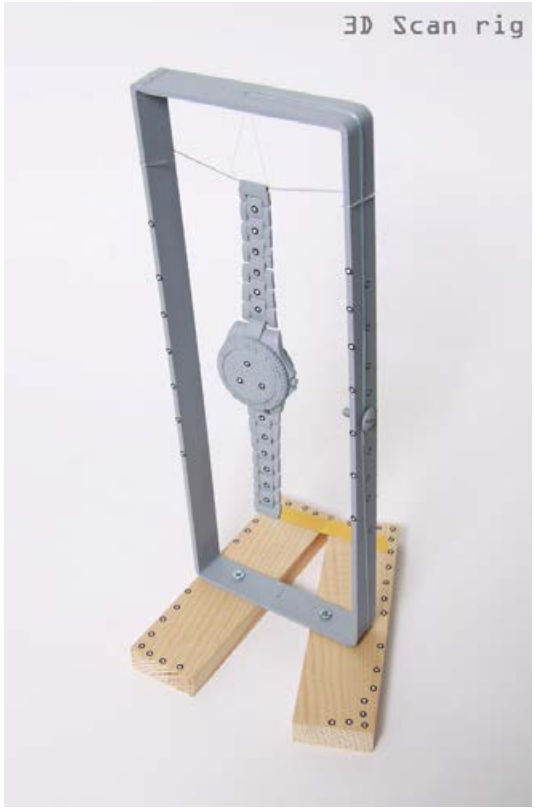

Fig. 34 For scanning, a rig had to be built which would hold the watch in a stable position, accessible from all sides with a hand-held scanner. Reference points for the scanner software were applied to determine its position in space and relation to each other after the model was painted with a base coat to make it less reflective.

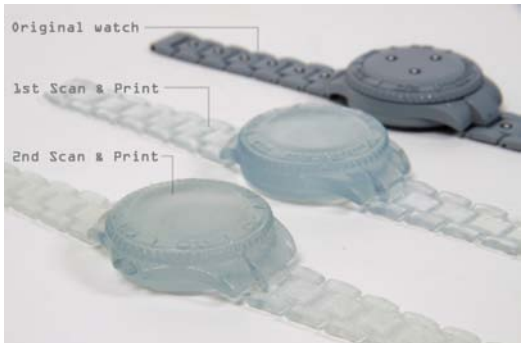

Fig. 35 Generations of scan and copy loops. The prints where done in an SLA process. The scan data were not remodelled but used directly as input for the next print process. Degeneration or distortion of shapes take place very slowly if common settings and best-build positions in the machine are used.

women's models, which are also usually smaller and even finer featured in their dial graphics.

Despite the similarities of the inner graphics, Neuland looked for a watch which could communicate its formal origin purely through its outer shape, as scanning would not allow going beyond the glass. Therefore the overemphasised, embossed numbers and digits on the ring were ideal, even though not as bold on the 'Submariner' itself. These details would hopefully distort in an interesting way through the process (which they did in the end).

The 'rip-off' hybrid was 3D scanned with a 'GOM Atos1' (accuracy ca. 20 Micron) after an initial test with a Roland LPX drum scanner. Scanning a watch on a cardboard tube in the rotating scan chamber turned out to be rather complicated (see fig.30), as surfaces in the 'scan shadow' got lost. The result required erasing the tube surfaces and rebuilding the back-facing surfaces of the watch. A better option was scanning the object mounted into a open rig (see fig.34), allowing access from all sides and repositioning the wristband-elements to an oval shape in a second modelling step. However, remodelling a 3D scanned data set is not straight forward. It is a rather time-consuming process, as many of the lecturer's students discovered when scanning their clay models as a reference for building a rapid prototype. Often they were catapulted back in their process schedule in a devastating manner while trying to remodel the scanned data (often with holes and surface rattle in them).

The scanner collects only a point cloud (in space). Additional software is needed to convert the points into a triangular surface or polygon mesh (in this case the GOM software was also used). Scanners usually come with such software, but depending on the quality, results can vary immensely. The mesh is usually rather data heavy (if a fine mesh is needed) and should be converted into a polysurface or nurbs to use the full scale of modelling tools available in Rhinoceros (the software Neuland used to rebuild and alter the outcome) or other 3D modelling software. Sometimes even opening and rotating such files on a medium spec computer can challenge ones patience. (Car manufacturers have entire departments with teams of engineers doing nothing else but remodelling – '*Straking*' – such (A-Class) surface scanned data.) In a low-tech and low-manpower environment, Neuland therefore suggest using the scanned data for rapid prototyping directly if possible and cleaning up surfaces and lines manually in the hard model coming out of the machine – making it a soft to hard converter. (This however is only possible if the model is not meant to be hollow or divided into different parts.) Untrained 3D modellers (like most students) usually end up with a poorer surface result in CAD than what they initially manually developed in automotive clay – the physical

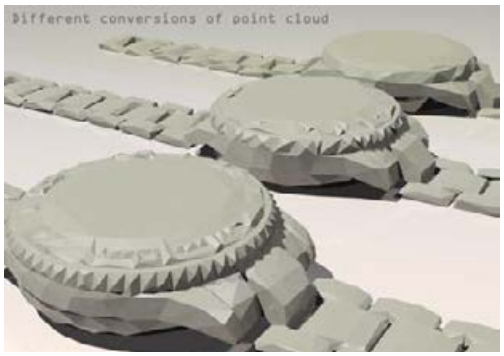

Fig.36 The point cloud from scanned data of the 2nd print were converted into different dense triangular surfaces; in the front is a higher resolution than in the back. The version in the front was chosen to carry on with as detail features are still visible rudimentarily and therefore link back to the stereotype of a luxury watch.

Fig.37 Visible patch in architecture. Old and new structures are easy to identify. During the Valuegraph design it was also tried not to mimic or blend into given surfaces, but add new features clearly visible through Boolean operations.

Fig.38 Clearly visible margins between original surfaces and new sections. In this case the missing original data was replaced with different filling structures from Netfabb, showcasing different structure patterns. An option for other design applications?

feedback and visual dimensions are a clear advantage in real-world modelling. This is why car manufactures still stick to full scale physical clay models despite being extremely expensive to build.

For untrained CAD operators the problem with point clouds is that they do not identify surface transitions (edges), part or feature lines – which would be far more helpful when rebuilding an object from scanned data. Using a pointer arm and digitalising points along an edge and at the peak of a surface, seems far more efficient for such a purpose.

When trying to rebuild surfaces and filling holes in a 3D data set (mesh) – especially those collected from nature or the physical environment – an interesting option for manipulation occurs. Instead of trying to blend or rebuild seamlessly, one can clearly mark the patch margins seperating original data areas and by the operator/interpreter filled in surfaces. The obvious transition breaks can be seen as exclamation marks showing where the quote ends and the interpretation/manipulation starts. This approach is common in restoration of architectural structures. Neuland also tried not to mimic or blend into given surfaces during the Valuegraph design, but add new features clearly visible through Boolean operations when altering the inner display part of the watch and rebuilding the wrist band links. However, as there were no holes in the scanned data and the surface character rather simple, this idea could only be followed to a limited extend. There might be better applications for this approach; further experiments are planned.

PHOTOGRAPHY: GABRIELE INZAGHI WRITERS: PEI RU KEH, EMMA MOORE, ELLIE STATHAKI NEWSPAPER | 039

NEW RESOLUTION

Having seen a wealth of projects mixing art, technology and design, we knew at a glance that United Nude's Lo Res was different. It is a new method of design, creating objects that look playfully low resolution. 'Take any item and tell a computer to generate different versions by changing a very high resolution file to a lower resolution,' says Rem D Koolhaas (architect and nephew of OMA's Rem Koolhaas), who founded United Nude in 2003 with Galahad Clark (of British shoe dynasty Clarks). The company first used its method to produce characteristically architectural shoes. Now it is expanding into accessories and high-end design, and has just partnered with 3D software company Rapidform to develop a Lo Res design software.

www.unitednude.com. *To read our interview with Rem D Koolhaas, visit www.wallpaper.com* ★

DESIGN

Wallpaper*

Fig.39 Cut out from an article about the United Nude project with Rem Koolhaas found in wallpaper of June 2010. The process of reducing scanned data was used to design a new shoe (see below). In Neuland's opinion, however, the triangular, crystalline-like surface character makes more sense in a precise and solid metal object like a watch.

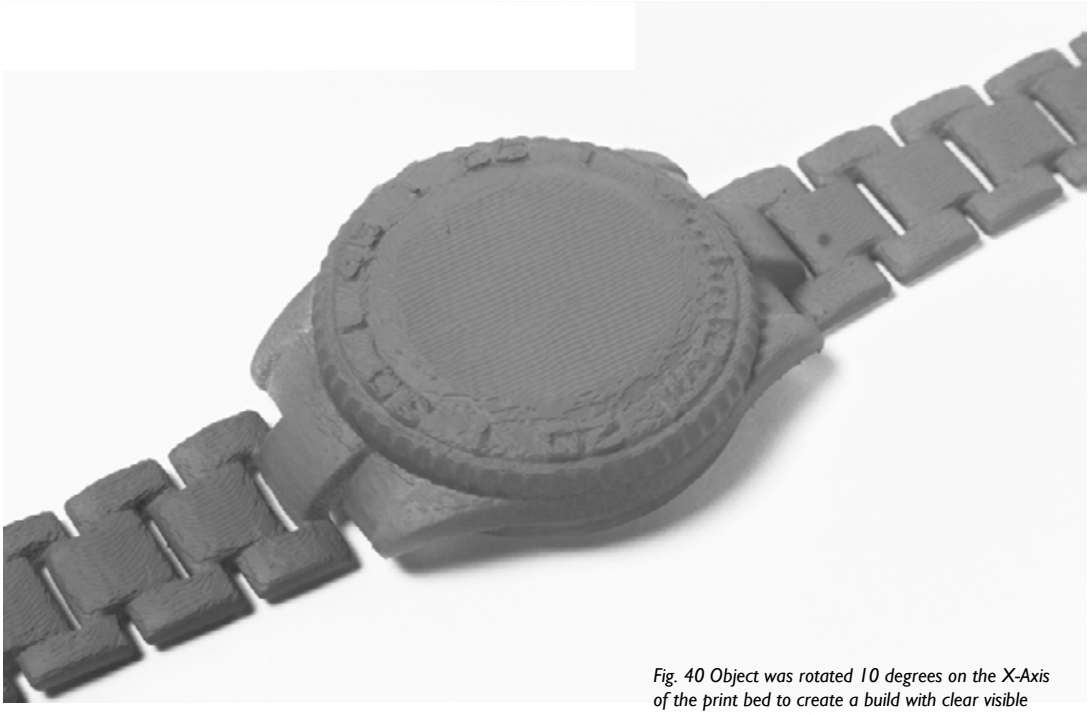

Fig. 40 Object was rotated 10 degrees on the X-Axis of the print bed to create a build with clear visible stair-steps on all surfaces. This pattern is reminiscent of wood grain or finger prints. Suitable for a metal luxury watch?

As to be expected with process software the possibilities for manipulation are wide (almost overwhelming). Converting point clouds into mesh can end up in extremely dense and fine surfaces (high resolution) or result in an extremely simplified triangular object (low res.), clearly making it a new object with very different formal-aesthetic features compared to the original that the scanned data came from. In such a case the first scan and print cycle will already deliver a distorted and posterized result – making it very different from the analogue photocopier process. This however took a while to be discovered and was not clear when starting out with the project. Once aware of this, Neuland found an interesting application in the literature. The internationally renowned architect, Rem Koolhaas, had done some case studies with this ow resolution option within scanning software. The result was a plastic shoe for the fashion label '*UnitedNude*'. (See www.unitednude.com) Koolhass created a new original idea/concept and artefact by starting off with a copy of another object. (It is very likely that the '*Chair_one*' from Konstatin Grcic was derived from a similar process, or at least inspired by it.)

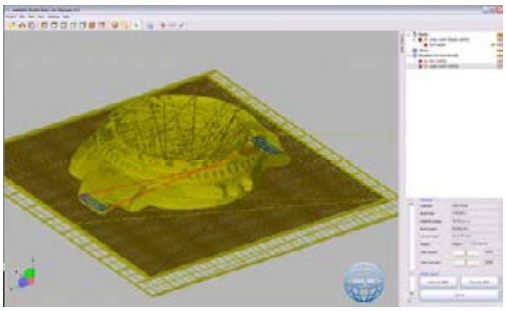

Fig. 41 3D models have to be converted from STL-files into print layers and machine code. The code determines layer thickness, print heat, print paths, support structure and more. The setting options are overwhelming and the results are sometimes more luck of the draw than controlled process results. (Here 'Netfab Engine was used', one of the two software options. 'Skeinforge'/ 'BfB Axon' are open source alternatives.)

As the software tries to create smooth surfaces from points in space with higher resolution settings, it will eventually also erase some of the 'stair-stepping' effects which come with additive manufactured models – unless the resolution is extremely high which makes the model hard to handle. Stair-steps are a result of printing layers.
A digital model is sliced into thousands of layers in the Z-axis. One layer is then built on top of the next, either by melting material or making a liquid resin solid with laser or UV light. (In this case the Stereolithography/SLA technique was used which works with resin and UV light.) Obviously the finer the layer, the less steps will occur. This means that in order to create distortion through stepping patterns, one has to use a lower resolution printer or increase layer thickness. With high-end printers (around 15-30 micron) one can barley see the steps, while open-source printers (around 0.3 - 0.5mm) show obvious melting lines.

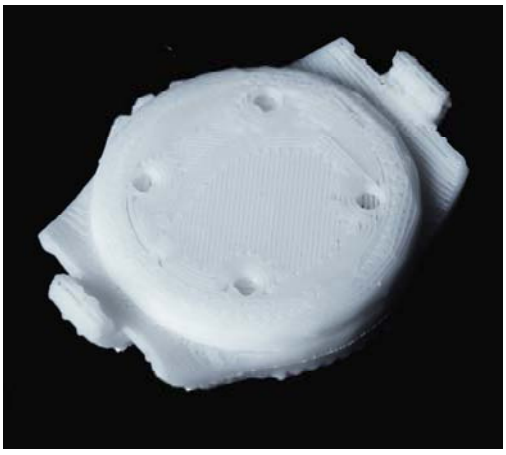

Fig.42 Thick layers and print nozzle diameter (0.5) of the Rapman 3.1 created some interesting patterns on the back of the ABS watch model. Overall the model is very rough and not dense enough. Preserving the interesting pattern might only be possible through direct casting.

One can also emphasise or minimise the distortion and stair-stepping effect by the way an object is positioned on the build bed in the machine. Usually operators of 3D printers try to achieve a low printing height to reduce costs and printing time (as each layer takes a certain time). However, if an object is rotated (for example 10 degrees in the case of Neulands watch) on the X or Y axis, a more even spread of stair-steps can be achieved over the whole object.

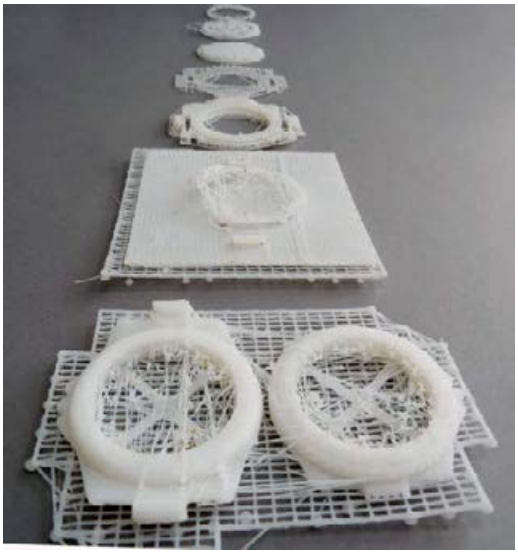

Fig.43 Sequence of Rapman 3.1 test runs with alternative print, support and raft settings did not produce a satisfying result. Some alterations to the machine might help. Not yet 'plug and play' for the masses!

However, when using default settings in scanning software some of these interesting distortion effects will be erased again with each new scan conversion. The overlapping of several generations of stair-steps

within a print is therefore hard to achieve. Neulands print results – using a 'Viper 250' from 3D Systems (SLA) – produced washed out features rather than interesting surface patterns (in the clear ABS resin with 0.1mm or 100micron steps). The low-tech machine Rapman 3.1, which uses a Fuse deposition Modelling (FDM) process, produced interesting patterns (see fig.42), but did not quite suit the luxury product he wanted to create. The soft, almost fabric-like 'spaghetti look', contradicts expectations of precision. With more tests, overlapping patterns might be achievable if well planned and communicated to the operator (service provider) of the scanning unit. In the end Neuland decided however not to go down this route with his watch.

One reason for this was that stair-step patterns achieved and desired in one area of the object, will in other parts interfere with mechanical functions or product assembly. It seems the only way to utilise such patterns selectively would be to produce the final object in an analogue casting process and refinish (touch up) certain parts of the object. Neulands aim, however, was if possible not to break the digital cycle. The final product should ideally be a new artefact from an original concept created with additive manufacturing techniques alone. (This seems not achievable at this stage. See below.)

While going through three cycles of copying and 3D printing it became clear that this process has an infinite number of variables (settings, filters, and build arrangements). The copyist can alter so many different settings that a controlled sequence does not make sense as it would try to create 'controlled randomness'. The process could either create an instant distortion and change of character (in one loop) or degenerate the object painfully slowly over an endless number of cycles with exploding costs. At this point it seemed pointless to carry on. With this insight, it was obvious that the old-school copying technique and the 3D counterparts are not equivalent in practise, despite being based on the same general idea. Electrostatic copy machines have a very limited range of setting options which can interfere with the transition from one medium to another. They are also cheap and almost instant compared to 3D scanning and printing. On the other hand the tests showed that 'manipulative copying' is possible with these digital technologies, enabling the creation of a new original concept and artefact from a copied original.

After receiving several scanned data sets converted into different surface resolutions, an option occurred; this was to cut the process short and go down a different pathway than originally intended. The triangular shapes, clearly visible in the lower resolutions, seemed to alienate and distort the original shapes enough to become something new. They also communicated precision. The triangled body and wrist

Fig.44 Final watch body printed with UP! Printer. This printer produces better results, but still struggles with distortion of parts. Notice the 'Spagetti-look' of the ABS layers.

Fig.45 The 'Cabestan winch'; well staged mechanic. Which seems no longer necessary with today's technology. Therefore such opulent mechanic solutions seem pure luxury to show of with. However, despite it being extremely expensive, it does not match typical expectations of luxury watches.

Fig. 46 The 'Opus watch' proves that a mechanic 7-digit display is possible on such a small scale. This model is also extremely expensive, but has a very 'mass market'/ 'consumer' look.

band still linked back to general proportions as well as detailing of the stereotype luxury watch without having the same surface features. The triangles supported the shiny metal appearance and richness of form features – giving them a high 'bling' factor without looking conventional or retro. Neuland chose the option which still featured some obvious remains of the initial embossed numbers on the outer ring (front left fig.36), finally converting them into 'genuine' and 'honest' ornamental features, rather than pretending to be a function no user ever uses. With this outcome the designer was convinced that the results of several copy and conversion loops could fit into the luxury watch bracket without being another product of direct formal-aesthetic incest and symbolic dishonesty (especially when linked with the idea of displaying nothing else but the value of the object itself).

In generative or random shape generation processes Neuland sees the role of a designer ('designerische Leistung') as selecting the best suitable result within a sequence. So, where the designer is not actively designing all formal features of a product and partly hands over the development to an artificial, non-human driven process, he has to put each result against a list of prior or during-the-process defined design criteria and make an active decision for or against them (similar to selecting shells or pebbles on a beach). But this is not where the process stops. The designer (creator) has to take the result of random form generation and make a functional product (meaningful artefact) out of it. This means he has to take the raw material of such form generations – basically an empty shell – and fill it. In the analogy of the copy machine artefacts, one has to organise the position and add to the generated/distorted components in order to create a functional, meaningful layout and message.

Here-in also lies the answer to the question 'Can 'manipulative copying' create new original ideas/concepts and artefacts? During the conversion process of form-clusters (with a certain inherent meaning) from one media to another, a re-coding by the to-be-creator has to happen in order to result in a new original. The reflection (germ: '*Abbild*') of the copied artefact in such a process is deconstructed, filtered and reconstructed again in a new medium. Only if the reconstruction is sending a different, new message can the result be seen as a new original idea and artefact. This clearly happens in the case of caricatures (see 'Man with gold helmet' painting Fig.17). It is also the case when designers cite iconic forth-runner products and set them in a new production, form, system or philosophical context – like Marten Baas (Furniture series '*Smoke*') or Jochen Gross (digital crafts '*Ulmer Hocker*') did with their furniture.

In the case of the Valuegraph, the re-coding is achieved through:

Fig.47 Different interfaces for displaying the watch's value on the Rolex-inspired copy. Ideas were generated with research assistant & industrial design graduate, Josh Puno. It was decided to go with a rather simple and classic option with 5 number elements. A LED or LCD display was excluded as it might look too cheap and 'consumer-ish'.

Fig.48 General design direction of display including Logo (EGO) and Model name (Goldmember). Some changes had to be made due to issues with the limited ability of SLM or Wax-FDM machines to print (and cast) fine details like the walls between each digit.

1. erasing the time function and replacing it with displaying the changing value of the watch itself,
2. condensing it to a core stereotypical luxury watch shape, and
3. making disguised ornament, formerly hidden behind pseudo-features, actual ornament and through this maintaining the richness of formal-aesthetic features.

During this re-coding and active creation process an array of decisions had to be made, especially around the value display of the watch which then again affects the whole object shape.

Fig.49 Above: Alterations of the 8-digit typeface were tested in order to increase formal-aesthetic cohesiveness, readability and spacing. For the final model a narrower version of the rectangular type was chosen.
Fig. 50 Below: CAD rendering with digits elevated to display value. An embossed option was tested in the final model to enable illumination of digits. Readability remained an issue. Elevated digits appear to be the better option at this stage.

Going with a digital number display rather than an analogue radial dial seemed obvious for several reasons. Displaying money value is easier to read when linearly presented. This is especially important as readability has to be guaranteed for the audience, not only the user himself. Any kind of encryption would fail the purpose of such a device. With using a digital digit display it also becomes obvious that a new element has been added to the stereotypical shell. It is an 'on purpose inserted break' within the typical formal-aesthetic language. And despite aiming to be inspired by classic luxury items it links to street culture, away from the aristocratic, old-money milieu. In this regard the mix somehow reflects a postmodern society.

However, instead of using a LCD or LED display typical for 7-digit displays, it was decided to make the digits mechanically driven. This links back to the mechanic roots of luxury watches and adds an expensive mechanism, making it rather exclusive in price. Despite the fact that with the 'Opus' watch (see fig.46) it has been proven that such a solution is possible in general, the additive manufacturing aim made it rather difficult to produce such a watch with SLM. The process is able to sinter gold powder, but only to a detail scale of about 0.4mm. Unfortunately the connecting ligaments between each digit cut-out were initially between 0.1and 0.2mm. Attempts to alter the spacing of the digits were not successful as they affected readability. This made it necessary to scale the whole watch by 115% and erase parts of the initial wrist band. Even than the SLM process was not able to produce these fine ligaments so that the digits had to be redesigned to work without them. (Which heavily affects the internal architecture of the watch.) With 0.4 mm details achievable it seemed theoretically possible to print the band as one moving part (chain) like often promoted in adds for RP machines. This option seemed to enable ready-to-wear parts direct from the machine (instead of time consuming manual assembly), also opening up some interesting after-market opportunities for other luxury products. Reality is however that so far Neuland was not been able to find a service provider who actually can achieve this aim. Even printing the main body of the watch in Titanium on a SLM machine was not successful yet, showing that the claim 'manufacture for design' (opposed to the traditional 'design for manufacture') is misleading. Making designers and engineers believe that they can create any given shape with additive manufacturing or RP is plain untrue. Reality is that, just like traditional reproduction methods, these new digital reproduction methods restrict the design and have to be considered from the start as Matthias Bringezu from Formera, Melbourne points out. However do they give more design freedom than traditional methods. The slogan 'Complexity is free' tries to point out the new gained freedom, but does not indicate the limits of these new technologies.

Fig.51 Test print of digit detail with SLM process in titanium; with welding lines clearly visible. The 0.4 mm wide ligaments challenge the machine. They were later removed from the design. See below.

Fig. 52 Even after several attempts the experienced SLM operator was not able to print an undistorted model of the body and inlay in titanium. Obviously 'design for manufacture' has not yet shifted towards 'manufacturing for design' despite improved technology. - After all the 'endless possibilities' of additive manufacturing seem still limited by the process used.

Fig.53 The initial manipulated scanned data (at the back) had to be reworked to suite the 3D printing machine capabilities. Even with additive manufacturing the constraints of production are far from gone. Wall thickness and detail size are limitations to work around.

To deal with the failed aim to stay in the digital production chain from start to final product Neuland also considered mixing digital and analogue processes by using wax printing (FDM) and lost wax casting. Even though, a ready-to-wear chain would not be possible with such a process it seems the most likely production method for the Valuegraph at this stage. It also comes at the cost of losing detail during the preparation of the wax plug (mould) and cleaning up the final cast. A model ordered through Shapeways and produces in their 'white detail printing' process (Objet 3D print with Acrylic-based-photopolymer) presented Neuland with these real life issues of cleaning up models and loosing details in such a fine featured object. The watch body was carefully sanded and already lost some of its hard edges which showed well in the CAD rendering.

Fig.54 Wristband with fixed elements printed in a steel-bronze composite with Direct Metal Printing, an alternative to SLM with a layer thickness down to 20 Micron. (See Shapeways.com). Unfortunately moving parts could not be printed despite a data set with 0.4mm spacing was initially provided. The process first produces a fragile powder print which is then sintered in a melting oven adding bronze. Moving parts might break in the powder stage.

In conclusion Neuland points out:

A. The creation of new (next generation) original ideas/concepts and original artefacts in a 3D environment through manipulative copying seems possible if the deconstructed information is re-coded. However, a new (next generation) original generated through such a process will hardly be as innovative as something built from a blank canvas (if this is even possible). On the other hand, it seems that newness and innovation, at any cost in the western society (and the design arena), are overrated considering that ideas need time to grow from infancy to adolescence. Not everyone who has a good initial idea can bring it to its full potential, sometimes these ideas/concepts have to be adopted by others to grow well. The brand 'Apple' proves this regularly.

Fig.55 Concrete printed building part from the Loughborough University developed within the 'freeform construction project,' 2010. Could this process produce fibre-enforced furniture generated through manipulative copying?

B. The digital 3D copy-and-print cycle offers so many options for adjusting, filtering, altering or distorting the result (or maintaining the input), which is not directly comparable with the random copying process of electro-static copy machines. Often one or two cycles are enough to change the form characteristic significantly. However, it is questionable if the pure copy-and-print cycle will bring enough exciting formal-aesthetical results in the long run. The most interesting options for new shape generation lie not so much in the multi-repetitive sequence (as it often just creates form-pulp), but in using alterations in resolution, print-bed position, layer height, print object fill and re-building lost surfaces (holes) with clear visual patches or new open structures. Re-organising data fractures or adding entirely new parts to collected (copied) surfaces could also be a more fruitful pathway; this is not simply manipulative copying, but sculpturing with samples (sampling), or 'remixing'.

Fig.56 Despite being an April Fool's joke, the vision of the 'tree-D printing' process will some day be a reality enabling the additive manufacturing of bigger wood-based structures.

Objects that are bigger in size and less constrained through their functionality (e.g. chairs) could be an alternative option. They offer more surface area to

manipulate or distort, with less effect on functionality or structural soundness when properly re-built. However, printing such big objects in 3D is either extremely costly or would require the use of different devices and materials. The British company 'd_shape' as well as Loughborough University experimented with concrete printers *[www.d-shape.com]*. A wood-based process might also be available soon; bigger wax or foam printers should be able to produce at such a scale in the future. Here again the question could be asked, 'Could lost wax casting be an option to produce the final outcome as well as the impregnation of powder based prints (if less brittle than current 3D prints of this nature)?

C. Looking more closely and realistically at the capabilities of current low-cost printing and scanning devices, the idea of personal fabrication labs in each office and home might have to be postponed for a number of years. They still remain a domain for a tech-savvy minority, as they are not plug-and-play applications like photocopiers. Even Jeron Junte concludes in an article kicking off the '(Un)limited Design Contest' of Premsela and Creative Commons NL *"…most digital production machines are valuable and not easy to use. No wonder that only a select company of students, artists and other creative professionals have found their way to the Fablab." [Junte, J., 2010, 'Open Design is not a clear-cut ideology, but it has different manifestations' retrieved 9.4.2011 from www.waag.org/download/76541]*

Neuland experimented with DIY open source device (Rapman 3.1 and UP! Printer – See fig.42-44). After many trials still no usable or only undistorted model could be produced with the Rapman (with ABS), despite using the recommended settings or following advice from different user blogs. However, the community also regularly presents good print results. Using the same data set with the UP printer rough, but undistorted result could be produced in ABS.

On the input side, more development is needed to make 3D scanning available for everyone. The scan result totally depends on good software to process collected point clouds. Looking at the outcome produced by hacked Xbox Kinects or other low-cost devices, they still seem far from being usable for the suggested process (unless a certain degree of surface data loss if aimed for). However, 3D scanning could soon be an option in smart phones or consoles once 3D screens and applications are state-of-the-art in such devices. This could create an interesting 3D form data pool for designers and artists who plan to use sampled 3D elements from natural or artificial environments or subjects. The question about copy and original will then become even more relevant.

Fig.57 Cover of the 'Make' Magazine; Average people start to reclaim control over high technology.

Fig.58 Result of a 3D scan with hacked Kinect. To rebuild and close such a data set could be extremely time consuming. However, in such a surface mesh, holes could be filled with artificial structures creating an interesting contrast between original and new data.

Fig. 59 The 'Trimensional' App developed by Grant Schindler for the iphone and ipad is able to scan 3D objects with a built-in camera. It offers the option to export 3D printable data. The collection of sampling data on the go seems realistic; it also enables average users to directly re-print scanned objects.

Fig.60 Above: Data set used for printing the final model. It used embossed digits without ligaments. Lowered digits should make it possible to illuminate them from within.

Fig.61 Below: 18ct gold plated body, inlay and wristband made by Stereolithography and CNC milled acrylic parts for look like model. After failed SLM tests it is most likely that production parts would be made by lost wax casting and finished with CNC, etching and polishing.

The designer Max Wolf might not have had such 3D data pools in mind when designing his bootleg objects (see fig.19), but he followed a similar underlying philosophy. In the commentary describing the project he indicated how a new designer role could evolve when using pre-existing shapes and citations as raw material:

"Subject of design is no longer the approximation of form and function, but moreover the positioning in a target context by the means of 'meta-artistic' [germ.: meta-gestalterische] decisions, like the choice of citation [sample] or arrangement of found pre-existing elements." [Max Wolf, 2003, WWW.BOOTLEG-OBJECTS.COM]

D. Even today many people seem to overlook the role copies and replicas fulfil in building collective archetypes and brands and marketing them. Despite the fact that such products have a lower quality and could harm the brand if mistaken for the original, they also seem to educate not-yet-users and the audience of users of original copies (genuine luxury products). Replicas and fake products will still feed the desire of the user for the original. In this scenario the copy becomes a place holder, not a substitute.
From a design and market research point of view, design inspired copies and hybrids can tell researchers a lot about existing stereotypes and expectations within certain markets. After all, only objects or features which seem worth copying are actually copied.

Fig.62 Assembled look-like model without inner light and product graphic. Despite the real gold coating the watch looks rather cheap and 'fake'. Reason for this seems the rough finish – result of coating an unpolished print result which preserves stair-stepping and imperfect facets. Electroplating up to 0.4mm material onto the resin body rounded of meant-to-be hard edges. Especially the digit display becomes hard to read due to the radii which metal exaggerates even more.

So, what is copied has passed the market pre-selection, proving that the original concept/idea or artefact was in certain aspects relevant and successful. On the other hand they also consolidate the status quo and make it harder for new innovative ideas/concepts. In this regard the 'Valuegraph' would have failed as it tries to condense the formal-aesthetic and symbolic core of classic luxury watches. However, Neuland sees it rather as an extreme caricature which questions the status quo.

E. The idea of Open design and Open source seems to reflect a general shift in society. After years of excitement for everything virtual and digital, people realised how much they had became clueless puppets in a sea of black boxes – pulling strings which they couldn't see, fully control or actually understand. The desire to reclaim control and understanding triggered a new age of making. This time, however, it is not a traditional craft revival (like in the 70s), but reaches for objects and processes made or controlled by electronics. The ongoing DIY trend, the '*Maker Magazine*', the '*Ardunio Project*', '*Hackerspace*' and others, try to give control back to the average users. It seems that not only has the Mechanical age come to an end, but society has pushed against the exclusive ownership of production tools (aka. 'means of production') and knowledge by a few; this time without a Red October.

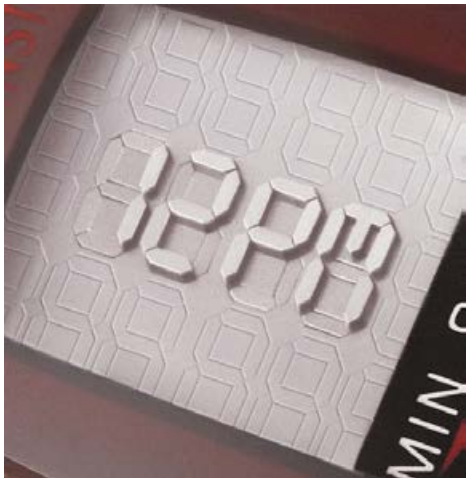

Fig.63 The Opus watch display shows achievable detail precision in order for good readability of digits.

"The production of goods shifts from manufacturer to consumer." [Junte, J., 2010, 'Open Design is not a clear-cut ideology, but it has different manifestations' retrieved 9.4.2011 from www.waag.org/download/76541]

So despite the fact that designers, engineers and any other creative minds will not be able to make a living from Open Design directly, it could help them to regain power over their creations. To get an idea/concept into the shops, in the past could have meant being condemned to charm the dragon – in form of big organisations which had the power to run costly production tools and supply chains. In the future there could be alternative pathways, opened up through open source contributions by creators. In such a scenario, not everything would be given away for free, the return of value would be different than in form of money though.

In an open source environment, which the internet in fact is, and with more high-end digital reproduction tools, our pool of data will become a powerful source of raw material for new creations. We only have to make sure that such raw data will be processed, refined and interweaved in a new context to avoid the incest of forms and ideas – which has never been a good basis for the development of mankind.

Fig.64 As readability remained a problem alternative mechanic display options were developed and evaluated.
Left: Metal band will roll up and down to display each digit;
Middle: Pentago- shaped cylinder rotates and shifts to display each digit;
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