

Aarhus School of Architecture // Design School Kolding // Royal Danish Academy

The simultaneity of complementary conditions

Wiesner, Thomas

Published in:

Changes of Paradigms in the basic understanding of architectural research

Publication date:

2009

Document Version

Publisher's PDF, also known as Version of record

[Link to publication](#)

Citation for pulished version (APA):

Wiesner, T. (2009). The simultaneity of complementary conditions: re-integrating and balancing analogue and digital matter(s) in basic architectural education. In A. K. Gelting, & E. Haader (Eds.), *Changes of Paradigms in the basic understanding of architectural research: architectural research and the digital world EAAE/ARCC conference, Copenhagen 2008* (pp. Bd.2 (268-289)). Kunstakademiets Arkitektskole, Institut 1.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

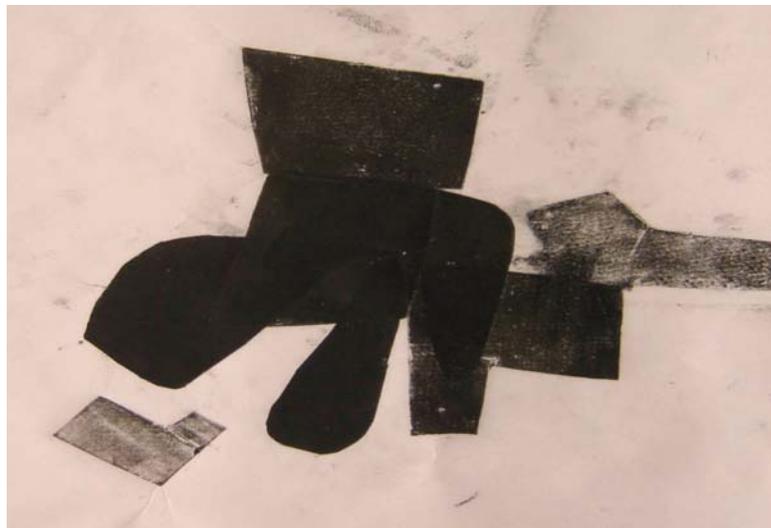
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Thomas Wiesner

Associate professor, architect MAA
School of Architecture, Royal Danish Academy of Fine Arts, Copenhagen
thomas.wiesner@karch.dk

The simultaneity of complementary conditions:

Re-integrating and balancing analogue and digital matter(s) in basic architectural education



The essential things in life are seen, not with the eye but with the heart
Antoine de St.Exupery¹

*The new media are not ways of relating us to the old "real" world;
they are the real world and they reshape what remains of the old world at will.*
Marshall McLuhan²

The simultaneity of complementary conditions:

Re-integrating and balancing analogue and digital matter(s) in basic architectural education

The actual, globally established, general digital procedures in basic architectural education, producing well-behaved, seemingly attractive up-to-date projects, spaces and first general-research on all scale levels, apparently present a certain growing amount of deficiencies.

These limitations surface only gradually, as the state of things on overall extents is generally deemed satisfactory. Some skills, such as “old-fashioned” analogue drawing are gradually eased-out of undergraduate curricula and overall modus operandi, due to their apparent slow inefficiencies in regard to various digital media’s rapid readiness, malleability and unproblematic, quotidian availabilities.

While this state of things is understandable, it nevertheless presents a definite challenge.

The challenge of questioning how the assessment of conditions and especially their representation, is conducted, prior to contextual architectural action(s) of any kind.

As the shift from analogue to digital is almost consumed, the loss of the inherent qualities of analogue procedures in grounding the creative, perceptive act in spheres of seemingly primitive analogies might be re-assessed. This re-assessment must re-balance the views on analogue and digital general-procedures on practical, cognitive and theoretical levels.

As both analogue and digital procedures in architectural education are fairly grounded in the respective historical conditions of their emergence and subsequent practise, any “novel” or oblique approaches will lead to certain controversies on how the actual course of action(s) might be inserted in a given curriculum, reflectively, as methodology.

The paper will, in broader terms, assess present curricular conditions, delineate potentials and pitfalls in actual media/reality cognisance, and then proceed to describing seemingly simple proposals for re-assessments in both analogue and digital procedure approaches.

These are grounded in both old-hat “common-sense” and an acute awareness of today’s digital media permeability in both virtual and real realms. The prime focus is devised on the cognisance of the pixelated frame condition, pervading all “seeing” and “involvement” in present daily life. The standardised frame(s) and their conscious integration - or parallel involvement with - analogue estimates, are subjected to simple constraints. The application of constraints, follow simple rules, reminiscent of OulLiPo devised stratagems. The constraints are subjected in both analogue grounded exercises and through various, easily available digital media, to produce a potential renewed, acute awareness in the assessment of reality conditions and as stepping stones onto more conscious, basic creative acts. The resulting amalgam of analogue and digital blend(s) remains open to flexible readjustments, and to further fine-tuning according to relevant contextual conditions.

The paper will thus primarily focus on the practical implications of certain re-assessment and oblique renewed procedures, introduced in undergraduate architectural education focusing on analogue drawing skills-formation courses and their practical repercussions, combined with – equally – re-evaluated prime digital approaches in parallel or subsequent design-studio work(s). The presentation of the paper will be accompanied by various case-study examples from 1st and 2nd year undergraduate works (2005-07) interpreting and visualising the used MO and the results, thus presenting the case for “The simultaneity of complementary conditions”.

The simultaneity of complementary conditions:

Re-integrating and balancing analogue and digital matter(s) in basic architectural education

Some, seemingly oblique, introductory digressions

1

Intervals, space and movement

Freeze # one

In 1878, the photographer Eadweard Muybridge successfully captured sequences of a horse in fast motion, using a series of twenty-four cameras. "*The Horse in Motion*", as the work was known, established visual proof that a horse's hooves all leave the ground for a moment, while in motion.

With the clever use of the latest available technology, Muybridge had been able to probe into seemingly complex matters of simple visual cognition and observation that had otherwise eluded illustrators and artists for centuries.

An ordinary moment, frozen, seized in a picture.

What had been speculated and disputed matter thus mutated into an established fact. This would be the basis for further studies and subsequent re-discoveries³.

Freeze # two

In 1968, the astronauts onboard the *Apollo 8* mission photographed the planet Earth in deep space while orbiting the Moon. This seminal image⁴ was the first ever of Earth, as seen and recorded by a human being.

A singular icon: sublime and immensely serene, almost intangible. Recording, and simultaneously freezing the amazing speed of the photographer's traveling and that of the earth's rotation, fixed in the blackness of space.

All appeared as anticipated. Yet, *this* particular iconography subsequently proved more than revelatory for a multitude of relevant and concerned topics⁵. The stunning sequel pictures of Earth and Moon seen together, recently taken from Mars, never really made the news headlines⁶.

Other cognition matrixes had, since then, appeared.

Freeze # three

In 1999, the science fiction movie "*The Matrix*"⁷ developed and popularized the use of a visual effect known as "bullet time", which allows the viewer to explore a moment progressing in slow-motion as the camera appears to orbit around the scene at normal speed.

The "bullet time" sequence established a virtual reality that has since become a seminal, cognitive frame of reference on how to experience simulated visual worlds⁸. The pervasiveness of this novel outlook and its actual overflowing spill into quotidian reality cognition has yet to be fully acknowledged⁹.

Its actual point of departure was, ironically, architectural¹⁰.

The above introduced three "freezes", could be considered as technical implementations of a progressively complex gaze on the world, the probing of ever expanding views on reality. Yet, this same progression had been underway for some time. With other, more traditional means at hand, operating on parallel with the growing use of novel technical paraphernalia.

This (re)search which also based itself primarily on visual cognition, perception and its representation attempted to tackle more conceptual issues of reality. Now that photography, and soon thereafter moving images, seemingly rendered the direct representation of reality somehow obsolete.

Old and new world where investigated with altered gazes, enabling the surfacing of matter(s) that where, apparently, more in the mind than in the world. Or so it seemed.

In that frame-set.

2

Surface, concept, context, and pixel

altered rendering #1

In the late 1880's, the painters Georges-Pierre Seurat and Paul Signac abandoned the common methods of blending pigments on a palette or using the many commercially available premixed colours.

By rendering reality through the filter of Pointillism, they came very close to emulating the CMYK printing processes and to some extent the computer monitors, TV screens and other digital equipment of a century later.

Flickering Chromoluminarism¹¹.

altered rendering # 2

In 1918, the painter Hans Arp produced a stunning series of grid paintings, along with the emerging geometrical, abstract endeavours of colleagues Piet Mondrian, Paul Klee, Ani and Joseph Albers.

While they all retraced the perception and the representation of reality with strictly geometric approaches, it is Arp's painting¹² that, in some very peculiar way, seems to transcend time. And, present us with the first analog pixilated image. What would then be considered as an abstract, flat surface, is, nowadays, an iconography intimately familiar to almost every child. Something very concrete: reality as it appears, translated via quotidian applications.

As on any LCD/LED screen: ubiquitous.

altered rendering # 3

Between 1913 and 1914 artist Marcel Duchamp created a thought-provoking, boxed artifact: "*Tree Standard Stoppages*".¹³ In the late 1940's Jackson Pollock developed his original, innovative "drip-painting" technique.

While both Duchamp and Pollock acknowledged the serendipitous momentum of randomness in capturing and re-representing reality, Duchamp embeds the arbitrary in a pataphysical¹⁴, semi-"ready-made" conceptual realm. Pollock on the other hand, opens a different field of investigative representation.

The "stoppages" mimic and reflect reality, enabling some possible contextual re-insertion, however absurd. The drip-paintings, seemingly contextually remote to anything concretely tangible, might relatively describe Nature directly. Rather than mimicking Nature, they adopt its language - fractals¹⁵ - to establish own, novel patterns¹⁶.

Yet both could be considered "precise" measurements of conditions, represented.

altered rendering # 4

On the cover illustration for the March 23, 1976 issue of "*The New Yorker*" magazine, artist Saul Steinberg¹⁷ depicted a map of the world as seen by self-absorbed New Yorkers. This now famous, seminal iconic map entitled "*View of the World from 9th Avenue*" delineates not real space, but a mental geography.

Some weeks after the September 11 terrorist attacks, FBI agents called at the Whitney Museum of American Art to inspect a drawing on exhibit at the museum. The Piece was by artist Mark Lombardi¹⁸. On Huge sheets of paper, Lombardi had created intricate patterns of curves, arcs and lines using just a pencil, to illustrate links between global finance and international terrorism.

While Steinberg's drawings translate reality in subjective humorous, innovative visual reflections, Lombardi's seemingly subjective conceptual work, however, firmly embeds its objective facts – all obtained from confirmed, open media sources - into a different charting of reality.

Yet both attempt, graphically and with keen precision, to represent what might be behind the surface of the seen, using reality's presence.

altered rendering # 5

From 1997 to mid 2002, Japanese photographer Hiroshi Sugimoto¹⁹ set out to trace the beginnings of modernism via architecture by photographing a large number of architectural modern masterpieces²⁰.

The ensuing images, rather than accentuating clean lines and volumes, establish an eerie overall blur, intensifying the architecture in an almost surreal manner. Capturing not the buildings themselves, but a mind image. Taking the final three-dimensional object and sending it reeling back in time to its origins, to the architect's initial dream.

German artist Gerhard Richter²¹, on the other hand, takes the opposite approach. Painting from postcards or photographs, Richter equally establishes blurred visual icons, making " [...] *everything equally important and equally unimportant.*"²²

Both Sugimoto's and Richter's concerns in capturing reality, simultaneously challenges established notions of photography, painting, representation and perception.

Yet, opening up new fields of vision, while keenly concentrating on the fathoming and subsequent representation of reality.

altered rendering # 6

Since the 1970s, architect Bernard Tschumi has argued that there is no fixed relationship between architectural form and the events that take place within it. His seminal theoretical work "*The Manhattan Transcripts*"²³, tested the limits of the discipline of architecture in a series of conceptual drawings and collages drawn from literature, philosophy, music and film.

In the late 1970's architect Daniel Liebeskind's series of drawings entitled "*Micromegas*" and the follow-up "*Chamberworks*" in 1983, produced stunning illustrations of virtual abstractions of spaces. What then, seemingly, appeared as purely graphic work, has since materialized into an impressive portfolio of built, architectural iconic objects.

While Tschumi's built work lately²⁴ still somehow remotely concerns itself with haptic repercussions and with re-installing events in contextualized space, Liebeskind's subsequent realizations transcended the early conceptual approaches, and propelled architecture into the realm of sculptural-design-objects to be globally inserted wherever deemed opportune.²⁵

Both Tschumi's and Liebeskind's drawings were some of the last analogue productions of seminal iconic architectural representations, simulating virtual worlds of abstracted, conceptualized reality before the inset of overall digital representation in architecture.

Ironically, and paradoxically, representation and realization of reality seem forever to have merged into a parallel bifurcation, where the un-built image and its subsequent formal effectuation have become the same icon: A high definition, colourful pixelated image where virtual and real converge, in a Never-Never-Land of perpetual Now, oblivious to context, and to be transcribed everywhere.²⁶

A seemingly kafkaesque polarization.

And, a possible forthcoming depletion of reality perception, in the midst of ongoing activities.

3

Hapticity, rationality, representation and the architecture of the eye

In his fine, polemic *plaidoyer* for a more haptic and sensuous architecture, challenging the fact that modern consciousness and sensory reality have gradually developed towards the unrivalled dominance of the sense of vision, Juhanni Pallasmaa²⁷ quotes David Levin's plea for "*The urgent need for a diagnosis of the psychosocial pathology of everyday seeing – and a critical understanding of ourselves, as visionary beings*"²⁸

In the very short time since the first publication of *The Eye of the Skin*²⁹ wherein the western ocular-centric cultural development paradigm is condensely chartered, Pallasmaa has repeatedly stated, that:

*“architecture has turned into an art form of instant visual image. Instead of creating existential microcosms, embodied representations of the world, architecture projects retinal images for the purpose of immediate persuasion”*³⁰

What might have been, a decade ago, regarded as a somehow over alarmed statement of conditions, has unfortunately turned out to be an accurate prophetic assessment. The actual conditions are far worse, infused globally in the stampede for overall eccentric, large-scale architectural erections of instant visual imagery.

With the pervasiveness of the ocular-centric in all domains of life, architectural education is under tremendous challenges. The present day hopeful architects to-be differ radically from former generations. The ocular centric media-massage has already been incorporated since childhood, and is mutating further at a dizzying pace.

Virtual and real have forever merged in re-presentation, presentation and assessment of present. The analogue reproduction, seem as but one antiquated, biased view compared to the digital multi-manipulations infinite possibilities of today.

Already underrated in most architecture schools, or in a bewildered state of substitution, analogue representation are widely regarded as too tedious for further development in basic curriculum, as advanced digital MOs are developed to suit standard requirements of the architectural profession, the building industry and national/EU building legislation.

The replacement of poetic, ambiguous imagery leads to a possible rapid loss of haptic awareness of the world and of one's contextual, homelike embedment in it. Leaving only a surface image, concerned with its game-like similarities with other existing or coming *technocratic - edutainment* imageries.

The recent onset of academisation in architectural education further widens the gap between rational understanding and haptic sensibilities. While in-depth theoretic, philosophical, historic and technical knowledge are being emphasised as necessary prerequisites, the actual general training of basic haptic assessments is being neglected.

The genuine, apparently intangible creative act, encompassing a humanistic approach and intuitive understanding, is thus giving way to technocratic abilities to construct abstract models of understanding and explaining the world³¹.

Both the prevalence of general ocular-centrism and the academisation of imageries must be balanced by simple means. These simple means are often, *per se* humble and proven approaches. Their seemingly outdated, mostly crude analogue procedures can nevertheless embrace digital *modus operandi*.

While the unassuming, straightforward development(s) must be brought on level with ongoing technological Standards, the core of the balancing attempts should remain soundly based on haptic, apparently unsophisticated approaches.

The unsophisticated might, if well groomed, prove to be one of the very few assets left in a general technocratic and academic environment where architects could make a tremendous professional difference: Combining utterly simple analogue tools with basic, ubiquitous digital paraphernalia to rapidly assess past, present and future conditions and present visions in educated, intuitive perceptions.

Speedily figured out, in a fraction of time, based on broader, holistic understanding(s).

“Figuring-it-out” has nothing to do with numbers or the understanding of theoretical concepts, nor with the concoction of superficial imagery. But with the practice of intuitive yet conscious sensing, via seeing.

And *this* needs to be conveyed.

And: trained.

The actual training MOs should be, according to the very limited time now available in the loaded curricula, subjected to more rapid deployments³², more on par with digital technology's basic speed.

Humble attempts

The following is a brief description of undertaken attempts to re-vitalise analogue drafting education in basic undergraduate, architectural 1st, and 2nd year studies, under given circumstances at the School of Architecture at The Royal Danish Academy of Fine Arts in Copenhagen.³³

The re-vitalisation of analogue drafting skills is seen close connection with the prevalence of common, ubiquitous digital tools, to be integrated.

The description is not meant as any novel course of action, to be re-emulated.

It remains a humble attempt to navigate under given circumstances, where various conditions prevailed and focus the didactic work in progress on the general, basic knowledge and skills to be incorporated and communicated,³⁴ while maintaining a concentrated level of haptic, poetic-tectonic of awareness during the course of action.

The course's MO has little in common with traditional academic drawing exercises, yet, incorporates elements of the former, in abbreviated versions with a clearer emphasis on architectural matters, general spatial awareness, rapidity of action and the incorporation of conscious use of simple digital procedures.

It is, indeed, a crash course.

Basics for *analogue* grounding

I

Restraint(s)

In a world cluttered with gadgets, the first basic gesture would be one of restraint. 8B lead pencil; Pencil sharpener; Cheap, dry oil pastels. Black only. No colours. Paper: standard white, A4 /80 g paper. This would be the simple means, throughout the whole 1st year course, including homework.

“It will be clear that we exclude expressive drawings as a beginning. Experience shows us that in young people this encourages artistic conceit but hardly results in a solid capability which alone can give the foundation and freedom for more personal work” Stated Josef Albers on his views on teaching drawing³⁵

Although the circumstances are far from Albers's course conditions, the main emphasis would equally be on excluding expressive, academic correct drawings, while concentrating on line(s), surface(s) and pattern(s)., with a keen and rigorous emphasis on architectural matter.

Establishing some sort of common ground, a capability of reflective “handicraft”.

Albers teaching where from a time were most visual representation remained analogue, and technical means, if available, lengthy and above all costly. The situation today is reversed, yet, with little time allocated to simple, handicraft based tasks, as one pre-supposes that this can easily be bypassed technically.

It can. Indeed.

Via digital means, everything is at instant disposal. Every detail in the whole picture, the entire globe even. Why bother, then?

The conveyance of restrain serves one primary purpose: to eliminate the superfluous, in a world of ubiquitous present. To sift through visual matter and thus establishing adequate professional filters, enabling the capability for a conscious, clear vision³⁶. This “*solid capability*” would be the primordial, analogue aim³⁷.

II

Repetition(s)

Claude Monet knew “... *that to paint the sea really well, you need to look at it every hour of every day in the same place so that you can understand its way in that particular spot*” and thus reworked the same motifs over and over again.

While repetition is an accepted phenomenon in the practice of music or sports, thus understandable for most students, the mere repetitive act in a drawing class is often considered a tedious waste of time.

Yet, this is one of the most crucial ability to be trained.

To draw what one actually sees and not what one *imagines* knowing. And then, to look again: to approach the white, empty piece of paper with a sense of reverence, anticipating the same line, anew, forming a more precise contour. And then, repeating the act again as if for the first time ever.

Until the sheer, exhaustive joy of exact seeing sets in. Regardless of the qualities of the drawn.

III

Speed

The actual speed with which today's technological paraphernalia enables one to record reality, makes the basis of the challenge in analogue drawing. If the capabilities were trained thoroughly, one would then be able to "*float like a butterfly and sting like a bee*" to paraphrase champion boxer Muhammad Ali.

The shortest exercises during the basic drawing course actually last under two seconds. Following the utterance of "impossible" situations³⁸, a start and stop signal, the only possibilities are a few strokes or dashes of a line.

Beyond the "game-like" setting, the exercise is about precision, conceptual reading, understanding of basic visual semiotic (sign and signifier), and first and foremost about the awareness of the difference between intuitive and rational approaches.

Throughout the whole course, a very fast, yet concentrated work pace was instituted.³⁹

IV

Left/Right brain use

In most of the ultra short exercises during the sessions, shift between Basics of Left and Right brain awareness are introduced, with just basic didactic explanations, to facilitate the work-flow process.

Betty Edwards's popular introduction⁴⁰ to drawing proved to be a fine overall rational initiation; the actual difference would lie in the more conscious shift from objects, bodies and faces to factual architectural and tectonic matters that would be intensively treated in the course of the exercises.

V

Filters, figure/ground relationships

In the midst of the short exercises, various figure/ground views were practiced. The initial free hand sketches were then repeated on the basis of simple b/w photocopies from various architectural motifs, initiating a conscious filtering of the seen into visual patterns, distorting recognizable views into formal tectonic abstractions, concretizing other realms to be investigated⁴¹.

VI

Body, proportions and scale

Traditional figure drawing exercises were included, albeit with an emphasis on rapid drawing, combining intuitive approaches with established techniques. These were used in adapted, hybrid ways accentuating general tectonic understanding.

One session was exclusively devoted to body measures, establishing for each student a catalogue of personal body data. These were then used with conscious, yet swift awareness when confronted with spatial issues, connecting haptic cognitions with the ability to perform rapid measurements and primary architectural assessments.

2

Basics for *digital* amalgams

While the introductory ground course included ultra-short basic knowledge of common perspective and 3D representations also conveyed via digital drawing courses, most of the work remained in the analogue domain. The subsequent follow up course would then include a simple amalgam of basic digital elements.

The overall pervasiveness of quotidian digital equipment is often underrated⁴² in connection with the usual 2D/3D drawing software knowledge introduced in basic architectural education. As these focus mostly on traditional project representation, i.e. Plans, sections, 3D renderings, and other, more direct, playful approaches using ubiquitous digital paraphernalia remain underdeveloped.

The follow-up course would thus concentrate on using the swift digital potentials while, at the same time, refining the basic, perceptive analogue handicraft skills established during the first year.⁴³

Three main conditions would be investigated in the course of the exercises:

i

Conditions of frame

As all areas of life are now recorded, translated and re-presented via digital devices, this implies one crucial, albeit still overlooked, condition: the pervasiveness of the pixel⁴⁴.

The standardization of this condition⁴⁵ is of great importance for the perception of imagery. Sight, and the translation of the seen, is enclosed in precise view-boxes, becoming simultaneously frame of perception and mind-frame. For the time being, still in a two-dimensional universe, yet rapidly mutating into the 3rd dimension.

To develop a conscious awareness of this condition, all drawing exercises and subsequent digital homework were to be submitted in standardized frames. Comparative knowledge in classical geometry was introduced via supplementary reading⁴⁶, and constituted an attempt to balance and bridge classical with digital conditions.

ii

Peripheral vision: blur v/s megapixel

The frenetic overemphasis on megapixel clarity in digital matter, combined with perspective conventions leaves one at loss. A peripheral, blurred and thus psychological subjective view of the seen needs to be trained to open up for broader views.

While artists have engaged in this for centuries⁴⁷, the common, popular notion of architectural representation these days seems to limit itself to what Pallasmaa dismissed as “*retinal images for the purpose of immediate persuasion*”.

In the analogue drawing exercises rapid shifts between various “filtering” techniques were used, thus achieving a more intuitive comprehension of the spaces investigated. During homework, the students were asked to experiment with their hastily recorded digital pictures and manipulate the images into blurs via basic Photoshop filters.

During the morning review of both analogue and digital print-outs, it was thus possible to introduce and briefly discuss the various topics outlined in this paper’s “introductory digressions”, while encouraging the students in further personal research in their subsequent design studio projects.

iii

Bullet time

The “bullet time” effect’s conceptual awareness is indeed already very much present in most students. Its subsequent pervasiveness in visual representation is seen with benevolent indolence. A condition appearing in movies, virtual games, simulations and simultaneously present when seeing the world, yet to their surprise, difficult to emulate when drawing, as it seems to belong to the digital domain.

To experiment and alleviate this matter, students are encouraged to draw with “a flying eye”. Regardless of distorted, perspective or correct axonometric proportioning. The result of the exercises made clear that this investigative visual territory could be explored much further, and the “flying eye” MO used with more conscious intuitiveness.

Further Hybrids.

The basic drawing courses briefly described are but two very short segments in the general curriculum. Dedicated and intensive conscious didactic teaching efforts are required to implement a feasible amalgam of analogue and digital matters in the actual design studio. Intuitively engaged, hands-on handcrafted: fast frottages, cheap lithographic prints, various photocopy playfulness, all re-embedded in analogue drawings, with an extensive and crude use of digital cameras to re-represent the digitally captured in new analogue forms.

Some of the topics raised in the “*altered renderings*” in this paper have been, obliquely, embedded in the conversations along the on-going projects. Sometime, with surprising effects of serendipitous synchronicity⁴⁸. Feeble architectural awakenings, yet more memorable than any well-founded theoretical lecture.

One other crucial issue to be discovered during the analogue courses sessions, if one would care to look carefully for the signs, is the statistically overrepresentation of students with the gift of synaesthesia⁴⁹. According to the French existentialist philosopher Merleau-Ponty, “*synaesthetic perception is the rule, and we are unaware of it only because scientific knowledge shifts the centre of gravity of experience, so that we unlearn how to see, hear, and generally speaking, feel.*”⁵⁰

Oblique approaches, reflections and otherwise holistic approaches might be considered “awkward”. And rightly so. For they establish some stance of resistance to accustomed software, routines and momentary dispensed, orthodox *en vogue* theories. Thus enabling individual student to move into the unknown with confidence and facilitating the capability for acts of genuine, hybrid “creation”.

Conclusive remarks

At a time when the fascination with advanced digital technology in architectural education compels many a school or department to leapfrog the analogue fundamentals and go directly to the production of architecture projects, it might be wise, for a moment, to re-assess some conditions.

Simultaneously, the present overemphasis on introductory academic theory courses in the undergraduate curriculum further distances students from having genuine cognitive experiences with haptic issues and intuitive, creative approaches to basic architectural cognitive matters.

Creative issues and the implementation of oblique approaches to problems often cannot depend on rational knowledge alone, and must encompass other views, however subjective, to produce genuine, novel and imaginative undertakings.

At the base of it all are some simple circumstances: the ability to assess and cognize the world around us⁵¹, in a clear, yet personal way. One of the fundamentals for this lies not in absolute theoretical understanding of environments, but in the translation of factual matter into oblique renewed views; some knowledge of lateral thinking⁵² and of ways to display evidence for making decisions⁵³. Yet, it is the perpetuation of archaic, hands-on analogue work that actually makes the ultimate difference to technical schools or university institutions.

One thing for sure: the old-fashioned, academic in-depth introductions courses to drawing and various analogue approaches are indeed, out-dated and must be readjusted to the present conditions⁵⁴.

These re-adjustments must take the prevalence of the digital into account⁵⁵, and focus on establishing more flexible, playful, yet factual haptic outlets using simple digital technologies⁵⁶

The somehow benign description of the humble attempts at re-balancing some fundamental issues does, certainly not represent any novelty at all, as the concerned issues still are in a state of transition. Forgetting to encompass these topics in a conscious way may though, in few years, result in impoverished conditions that would, later on, take years to redress.⁵⁷

Architectural education should be able to incorporate these matters in a sensible way, retaining pedagogical approaches that may seem naïve, almost alchemical in their seemingly mercurial intangibility⁵⁸ compared to dogmatic technical or other theoretic knowledge. Regardless of analogue or digital.

Let's see⁵⁹.

Notes

- 1 Antoine de St.Exupery: "*The Little Prince*". There are two other main points in the book, both spoken by the fox. They are: "*You become responsible, forever, for what you have tamed*" and "*It is the time you have spent with your rose that makes your rose so important.*"
- 2 Marshall McLuhan, "*Counterblast*", Toronto: McClelland and Stewart Limited, 1969, p. 52
- 3 "*Horse in Motion*" is part of Muybridge's extensive 11 volumes work of "*Animal Locomotion*". He later expanded his studies with the human body in motion. See Edward Muybridge : "*The Human Figure in Motion*" and "*Animals in Motion*" ed. by Lewis Brown Dover Publications, Inc. NY, USA ,1957.
- 4 An online picture can be assessed at NASA's Earth Observatory site >
http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=15293
- 5 On Apollo 8, human beings saw, with their own eyes, the Earth as a sphere in space. Few sights in human history have been as exhilarating as that first Earthrise over the lunar horizon. These new views of the Earth in space were an unforeseen revelation. Interest in ecology and the protection of the Earth's environment can be traced to these first missions to another world.
- 6 The first image of Earth ever taken from another planet was recorded by the NASA *Mars Global Surveyor* orbiting Mars on May 8, 2003 at 13:00 GMT (6:00 a.m. PDT); Link to image >
http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=15293
- 7 10 short video clips from the film and its sequels can be viewed at >
<http://whatisthematrix.warnerbros.com/>
- 8 See also: The Frenzy of the Visible: Spectacle and Motion in the Era of the Digital by Angela Ndalians link: <http://www.sensesofcinema.com/contents/00/3/matrix.html>
- 9 Vilem Flusser's philosophy of photography describes a world fundamentally changed by the invention of the "technical image" and the mechanisms that support and define industrialized modern culture. Flusser (1920 -1991) did not live to experience *the matrix's* ravages, but his critical views on the implications are already clearly outlined in his approach to photography.
See:
Vilem Flusser: *Towards a Philosophy of Photography*, London: Reaktion Books. 1999.
- 10 The Campanile at the University of California, Berkeley, was the first architectural object subjected to virtual camera moves by Paul Debevec in his ground-braking "Campanile movie" (1997) Technology and know-how then made their successful transfer to Hollywood via Debevec's Phd Student George Borshukov. Borshukov was hired by *The Matrix's* visual effects team to implement the "bullet-time" effects. Links: "The Campanile Movie": <http://www.debevec.org/Movies/debevec-campanile.mov>
Relevant cross-over facts at: <http://www.debevec.org/Campanile/>
- 11 Seurat's theories can be summarized as follows: "*The emotion of gaiety can be achieved by the domination of luminous hues, by the predominance of warm colors, and by the use of lines directed upward. Calm is achieved through an equivalence/balance of the use of the light and the dark, by the balance of warm and cold colors, and by lines that are horizontal. Sadness is achieved by using dark and cold colors and by lines pointing downwards.*"
Ruhrberg, Sneckenburger, Walter,Honnet, Fricke : *Art of the 20th Century*, Taschen 2000, p. 15
- 12 Jean Arp /Hans Arp: *Collage*, from 1918 is one of his most stringent, geometric-abstract art piece. Arp is nowadays mostly known for his for his more "figurative" abstract works.
- 13 " Duchamp dropped three threads, each a meter long, on to the same number of Prussian blue cloths/canvas. Then they were stuck to the surfaces without any adjustments to the curves that chance dictated they fell into. He then cut up the cloth and stuck it to glass plates, finally encasing them in a wooden box. A few wooden "rulers," which were cut following the same curves, were added." Web link with further hyperlinks:
<http://arthist.binghamton.edu/duchamp/Standard%20Stoppages.html>
- 14 '*Pataphysics*, a term coined by the French writer Alfred Jarry, is a philosophy dedicated to studying what lies beyond the realm of metaphysics. It is a parody of the theory and methods of modern science and is often expressed in nonsensical language. It has been defined by Jarry in "*Exploits and opinions of Faustroll, Pataphysician*" as "*The science of imaginary solutions, which symbolically attributes the properties of objects, described by their virtuality, to their lineaments*".
See :

Alfred Jarry: *Exploits and opinions of Faustroll, Pataphysician*, Exact Change, Boston, 1996.

A recent, interesting work on 'pataphysics, examines the relationship of rule and chance, of science and poetry, of the rational and the surreational as a ludic counterpart of Nietzschean philosophy.

See:

Bök, Christian: *Pataphysics: The Poetics of an Imaginary Science*, Northwestern University Press, Evanston, 2002

- 15 [A fractal is generally "a rough or fragmented geometric shape that can be subdivided into parts, each of which is (at least approximately) a reduced-size copy of the whole, a property called self-similarity. The term was coined by Benoît Mandelbrot in 1975 and was derived from the Latin fractus meaning "broken" or "fractured."] See: Mandelbrot, B.B. *The Fractal Geometry of Nature*. W.H. Freeman and Company, 1982
- 16 Richard P. Taylor, Adam P. Micolich & David Jonas : *Fractal analysis of Pollock's drip paintings*, Nature 399, 422 (3 June 1999)
- 17 Saul Steinberg (1914-1999), one of America's most beloved graphic artists, was actually trained as an architect: he graduated in 1940 from the Milan Politecnico before immigrating to the US in 1942. The Saul Steinberg Foundation maintains a fine web site on-line, where Steinberg's works can be studied. Link: <http://www.saulsteinbergfoundation.org/>
- 18 Mark Lombardi (1951-2000) was an American Neo-Conceptualist and abstract artist. Lombardi main work consists of huge diagram-like drawings, meticulously crafted with simple pencils. Lombardi called his diagrams *Narrative Structures* and they are structurally similar to sociograms – diagrams drawn from the field of social network analysis. In Lombardi's historical diagrams, each node or connection was drawn from news stories from major reputable media organizations. The aesthetic impact is unique – the schematics are elaborate and delicate, yet precise and factual spiderwebs of illustrations depicting networks of criminal conspiracies. See: Robert Hobbs: *Mark Lombardi: Global Networks*, Independent Curators International, NY, 2003
On-line links:
Richard, Frances (2002). "*Obsessive-Generous: Toward a Diagram of Mark Lombardi*", Wburg.com, Vol. 2, #2, Winter 2001-2002 issue. Reduced version of article included in the Global Networks catalogue. <http://www.wburg.com/0202/arts/lombardi.html>
- 19 Hiroshi Sugimoto was born in Tokyo, Japan in 1948, and lives and works in New York and Tokyo. Central to Sugimoto's work is the idea that photography is a time machine, a method of preserving and picturing memory and time. Sugimoto sees with the eye of the sculptor, painter, architect, and philosopher.
- 20 His seminal, blurred "*Architecture*" series of photographs were taken with an old large-format camera, with focal length set at twice infinity and no stops on the bellow rails. Sugimoto's homepage > <http://www.sugimotohiroshi.com/> or, consult the extensive catalogue : Hirshhorn Museum/Mori Art Museum: *Hiroshi Sugimoto*, Hatje Cantz Verlag, Ostfilden, 2005
- 21 Gerhard Richter (b 1932) is considered as one of Germany's leading post-WW2 artists. His work is characterised by a seemingly polarity between abstract pieces and his hallmark "blur photo-paintings". His work can be assessed via his extensive web-site. > <http://www.gerhard-richter.com/>
- 22 "I blur things to make all the parts a closer fit. [...] My sole concern is the object... What fascinates me is the alogical, unreal, atemporal, meaningless occurring of an occurrence, which is simultaneously so logical, so real, so temporal and so human, and for that reason so compelling. And I would like to represent it in such a way that this clash is maintained."
Richter, Gerhard: *The Daily Practice of Painting*; Writings 1962-93, MIT Press, Cambridge, 1995, p. 37
- 23 Tschumi, Bernard: *The Manhattan Transcripts* New York: St. Martins Press, 1981
In this work, Tschumi argues that "The transcripts *explicit purpose was to transcribe things normally removed from conventional architectural representation, namely the complex relationship between spaces and their use, between the set and the script, between "type" and "program", between object and events*".
The dominant theme of *The Transcripts* is a set of disjunctions among use, form and social values, offering a different reading of architecture in which space, movement and events were independent, yet stood in various relations to one another.
- 24 Tschumi's recently completed "Blue Tower" residential project in New York, (Nov. 2007) is a far cry from the *Transcripts* original theoretical thinking; Constrained by reality, the project deals more with strategies to maximize footage on site than actually addressing a contextualized architectural setting. See recent projects and their visualizations at Bernard Tschumi Architects web-site: > <http://www.tschumi.com/>

-
- 25 An overview of Studio Daniel Libeskind (SDL) portfolio of built work and ongoing projects can be assessed at SDL's homepage: > <http://www.daniel-libeskind.com/projects>.
- 26 It is interesting to note, while viewing the content of SDL's on-line site, that the Chamberworks graphics appear on par with the listing of built work and ongoing projects, as if to give the viewer a crude clue that graphics and architecture are indeed, represent the same thing. In presentations portfolio of ongoing projects of SDL, a number of "colourful" original artworks by DL depicting the projects are inserted. These are a very far cry from the "Chamberwork's" cultivated conceptual aesthetics, and convey an unbearably crude, clichéd, populist banality.
If this comment may seem biased, see i.e.:
<http://www.daniel-libeskind.com/projects/show-all/new-center-for-arts-and-culture/>
and click on the tumbnaill icons.
- 27 Pallasmaa, Juhani: *Hapticity and Time*, The Architectural Review, May 2000
- 28 David Michael Levin: *Modernity and the Hegemony of Vision*, University of California Press, LA, 1993. (p. 205)
- 29 Pallasmaa, Juhani: *The Eye of the Skin: Architecture and the Senses*, Wiley & Son, New York, 1996
- 30 Pallasmaa, Juhani: *Hapticity and Time*
- 31 This supposed superiority is both moral and intellectual. The intellectual superiority consists in its capacity to construct abstract models that academics believe enable them to explain the world. As Alan and Marten Shipman have argued in their recent book *Knowledge Monopolies: The Academisation of Society*, universities, especially the bureaucratized universities of the 21st century, love these types of models. Models enable them to reduce the abstract, complex and messy nature of the real world to something simple. See: Shipman Alan & Shipman Marten : *Knowledge Monopolies: The Academisation of Society* , Societas, Imprint Academic, Exeter, UK, 2006
- 32 Josef Albers' seminal drawing exercises, developed first at the Bauhaus, then refined at Black Mountain College and Yale were "carried out slowly [...] The aim was not slow drawing but disciplined drawing. [...] That the appearance and character of the line was an important lesson for those beginners who thought that drawing was just about making recognizable images.." See:
Horowitz Frederick , Brenda Danilowitz: *Josef Albers: To Open Eyes*, Phaidon Press, London, 2006 p. 158
- 33 The description of the attempts follows two basic courses: "Freehand sketching 01" and "Freehand sketching 02", compulsory for respectively 1st. and 2nd year undergraduate bachelor students.
The FS01 has been given 3 times, while FS02 has been given 2 times during the academic years 2005 - 08.
See:
Studiehåndbogen for Kunstakademiets Arkitektsskole 2005-06, 2006/07 and 2007/08; KA.
- In each course, 1st/2nd year students from two study departments participate, (approx 30-40 students).
FS01 stretches over 10 half-day sessions of 3 hours each, with compulsory homework ECTS 1,5
FS02 stretches over 5 half-day sessions of 3 hours each, with compulsory homework. ECTS 1,2
Similar compulsory courses were held with varying curriculum by other faculty in the same period.
- As each study department has a separate curriculum for the 1st. year students, apart from compulsory courses, the remaining descriptions focuses on parallel exercises in design studio project practice. (1st year students at study department 5 during 2005 - 08)
- 34 Although the description is specific to circumstances and context of the undertaking, its general assessment is considered to represent a broader issue and particularities that could also be encountered in other, architectural education establishments, at least in Europe, after the implementation of the Bologna Declaration.
- 35 Josef Albers, *Drawing*, unpublished paper on the teaching of drawing, 10 February 1941, JAAF Archive.
Quote from:
Horowitz Frederick , Brenda Danilowitz: *Josef Albers: To Open Eyes*, Phaidon Press, London, 2006 p. 152
- 36 Enns, James T : *The thinking eye, the seeing brain : explorations in visual cognition*, New York, W.W. Norton, 2004
- 37 The main, and surprising prevalent misconception in "drawing" relies on the fact that most students are still imbued with the romantic conception of traditional "academic" drawing. Some have even taken classical drawing classes, prior to starting in architecture school. Albers himself abhorred traditional drawing, as he considered it, rightly, to conceal the essentials in vision.

The situation is often made even more difficult, as older staff, teaching drawing maintain correct classic drawing courses, thus propagating “style” and “naturalistic” imagery as a correct way of drawing. Thus perpetuating of the common notion that analogue drawing(s) require “slowness”, and extensive use of time.

38 i.e: “draw the following: a blue mouse on a bicycle in sunshine/the Amalienborg square in rain/ a pistol being fired from a window/ a crowd in front of Eiffel Tower, and so forth.

39 The maximum allotted time frame for one drawing was approx. 2 minutes. When outdoors, this speed was kept, requiring students to observe time limits and return with a specified amount of work.

40 Betty Edwards has used the terms L-Mode and R-Mode to designate two ways of knowing and seeing - the verbal, analytic mode and the visual, perceptual mode - no matter where they are located in the individual brain. L-mode is a step-by-step style of thinking, using words, numbers and other symbols. L-mode strings things out in sequences, like words in a sentence. R-mode on the other hand, uses visual information and processes, not step-by-step, but all at simultaneously, in complex pattern recognitions, i.e recognizing the face of a friend. Both modes would be extensively used, with rapid shifts during the exercises. See: Edwards, Betty: *Drawing on the Right Side of the Brain* , Penguin Puttham, NY, 1979, The Danish version was used as introductory material: Edwards, betty: *At tegne er at se*, Nyt Nordisk Forlag, 1984

41 “Illusions” results in some of the drawings were given attentive care, enabling fruitful discussions on the nature of “object” and “space” and their objective v/s subjective representations, i.e ambiguous visually(*duck-rabbit*), distortion (*Müller-Lyer*), paradox (*impossible object*) and fiction (*kaniza triangle*). Especially *bottom-up/top-down ambiguities* in the perception of wire-framed cubes . Another topic to be briefly introduced in the review of some drawings was the distinction between *physiological* illusions related to *brain* and *cognitive* illusions relating to *mind*. See: Gregory, Richard L : *Eye and Brain: The Psychology of Seeing*, Oxford University Press, 2003, chpt. 10, *Illusion*

42 The impact of the astounding technical developments and at-hand capabilities in personal digital paraphernalia in recent years has yet to be fully incorporated in architectural education. While students are aware of the potentials at hand, (used on a private basis i.e youtube/myspace/blogs/ various musical endeavours), these fine array of tools are rarely put to effective use in the course of design work. Older teaching staff have yet to grasp the quotidian consequences and implications of this condition. Younger staff versed in digital matters, seem more preoccupied in elaborating ever more stunning virtual representations with highly complex, specialized software,thus bypassing more playful, simple experiments.

43 The intensive, 5 half-day sessions MO of FS 02can be summarized as follows:
Tools used: as in FS01, personal digital cameras, print-outs. All material to be presented in b/w on standard A4 paper;
Session one: general introduction, with textual handouts. A rapid exercise of story-board drawing on the basis of projected pictures on large screen in auditorium. Repetitions, quick crits, homework hand-out.
Session two, tree, four: homework assessment, rapid drawing at three different locations: The lobby of new Opera Building, The Interior of Chistian Chruch, The new Theatre lobby. Short crits, homework handout.
Session five: homework assessment and crits, 2 rapid drawing exercises of “flying eye” and hybrid views on KA campus. Final crit, assessment.

44 The term Pixel (for *picture element*) was first published in two articles in 1965 by Fred. C Billingsley of CalTech’s Jet Propulsion Lab. Subsequently, Pixel has become ubiquitous in the fields of computer graphics, displays, printers, scanners, cameras and related digital technologies with a variety of sometimes conflicting meanings. See: Lyon, Ricahrd F. : *A Brief History of “Pixel”*. Invited paper at the IS&T SPIE symposium of Electronic Imaging, San Jose, Cal. 2006 > <http://www.foveon.com/files/ABriefHistoryofPixel2.pdf>

45 [The display resolution of a digital television or computer display typically refers to the number of distinct pixels in each dimension that can be displayed. It can be an ambiguous term especially as the displayed resolution is controlled by all different factors in cathode ray tube (CRT) and flat panel or projection displays using fixed picture-element (pixel) arrays. One use of the term “display resolution” applies to fixed-pixel-array displays such as plasma display panels (PDPs), liquid crystal displays (LCDs), digital light processing (DLP) projectors, or similar technologies, and is simply the physical number of columns and rows of pixels creating the display.] Source: Wikipedia > http://en.wikipedia.org/wiki/Display_resolution

46 Elan, Kimberly: *Geometry of Design: studies in proportion and composition*, Princeton Architectural Press, NY, 2001.

47 In a very relevant article considering both technological and psychological variables in visual images E.H Gombrich discusses notions of “visual thruth” in the shift from clear to blur. See: *Standards of Truth: The Arrested Image and the Moving Eye*, p 244- 278 in

Gombrich, E.H, *The Image and the Eye : Further studies in the psychology of pictorial representation* Phaidon Press, London, 1982

- 48 The concept of *Synchronicity*, a term coined by C.G. Jung, designates a meaningful coincidence of two or more events, where something other than the probability of chance is involved. Chance is a statistical concept, which "explains" deviations within certain patterns of probability. Synchronicity elucidates meaningful arrangements and coincidence, which somehow go beyond the calculations of probability. While Jung had advanced the synchronicity hypothesis as early as the 1920s, he gave a full statement only in 1951 in a lecture. The following year, Jung published a monograph in a volume on synchronicity with a related study by the renowned quantum physicist and Nobel Prize laureate Wolfgang Pauli. In this book, Jung sought to reveal these coincidences as phenomena that involve mind and matter, science and spirit, thus providing some rational explanations for events like precognition, intuition inspiration and creativity.
See:
G.C. Jung, *Synchronicity: An Acausal Connecting Principle*. Princeton: Princeton University Press, 1973
Another recommendable work on this topic:
Allan Comb & Mark Holland, *Synchronicity: Through the Eyes of Science, Myth and the Trickster*. New York: Marlowe & Company, 2001
- 49 *Synaesthesia* is a general term covering the condition of a "confusion" of the senses whereby stimulation in one sense triggers stimulation of a different sense. A synaesthete might claim to be able to hear colour, taste shapes, describe the colour, shape and flavour of somebody's voice, or music, the sound of which looks like "shards of glass". Throughout history many notable artists have claimed to have synaesthesia, including Rimbaud, Kandinsky, Scriabin and the Russian filmmaker Eisenstein. Recent scientific research has moved the condition from the domain of mainstream neurology to mainstream neuro-science, though explanations for the conditions cause remain controversial.
See:
Harrison, John. E., *Synaesthesia: The Strangest Thing*. Oxford: Oxford University Press, 2001,
- 50 *ibid.* p. 19
- 51 Edward T Hall's theory of proxemics remains to this day, albeit in need of some re-adjustments, an indispensable stepping stone in basic architectural education, regarding the cognition of culturally based, basic spatial and haptic conditions. See:
Hall, Edward T: *The Hidden Dimension*. Garden City, N.Y.: Doubleday, 1966.
- 52 And yet another Edward to the collection of proven, "old-hats" references (although is later works are more dubious in their strict methodology)
De Bono Edward: *The Use of Lateral Thinking*, Penguin Books, London, 1977
- 53 Tufte, Edward R.: *Visual explanations: Images and Quantities, Evidence and narratives*, Graphics Press, 1997 and
Tufte, Edward R. :*Envisioning Information*, Graphics press, 1999
together with *The Visual Display of Quantitative Information*, these works represent a invaluable source of solid evidence in the communication of design projects. See also Tufte's fine and critical PowerPoint admonitions.
- 54 It remains a somehow difficult task. On one side elder faculty, versed in "traditional" ways of teaching perpetuate out-dated views of analogue visual matters, as they are the ones remaining with precisely that competence. On another side, younger faculty, enthusiastically enamored with the latest out-puts of state-of-the-arts digital software narrow the focusing field of basic visual perception, while producing dazzling visual projects, impressing and overawing the school's administration and students alike. The extreme fragmentation of curricula due to the Bologna declarations implementations further complicates matters.
- 55 Manovich, Lev: *The Language of New Media*, The MIT Press, 2001.
Hailed as "the most suggestive and broad ranging media history since Marshall McLuhan."
The "*Soft Cinema project*" mines the creative possibilities at the intersection of software culture, cinema, and architecture. In parallel, the project investigates how the new representational techniques of soft(ware) cinema can be deployed to address the new dimensions of our time, such as the rise of mega-cities, the "new" Europe, and the effects of information technologies on subjectivity. It must be noted though that actual haptic architectural awareness in this project is trailing closely to "*retinal images for the purpose of immediate persuasion*" > www.softcinema.net
- 56 Although "soft cinema" is an opening, the use of more basic digital tools can be recommended. With the easy availability of video capture of relatively high quality more experiments and are to be established. Easy on-line up-loading capabilities also permit more oblique use of blog services for design and project management. Some Scandinavian architecture schools have already started investigating this issue, i.e at the AHO in Oslo.

Architecture and film: Morphology of Body and Space #1 course . See: >
<http://aho.nxc.no/eng/content/view/full/1570>

- 57 A recent article in the German weekly “*Spiegel*” assesses the recent measured consequences of the implications of the Bologna declaration’s implementation in German higher education. It is sobering reading. Although architecture schools are not mentioned in the survey, the description patterns are comparable. See: *Der Spiegel*, issue # 18, 2008, *Die Turbo-Uni: Reformchaos - Hochschulen werden zu Lernfabriken*, pp. 56 – 69. (In German)
- 58 Ani and Josef Albers would often paraphrase Heinrich Wöflin who believed that “*learning to see*” is *learning to recognize, or in other words to learn to make judgments for the purpose of intensive and pure enjoyment, Seeing, in this sense, is not a thing of the retina and lenses, it is an activity that circumscribes the whole soul*” Horowitz Frederick , Brenda Danilowitz: *Josef Albers: To Open Eyes*, Phaidon Press, London, 2006 p. 13
- 59 Regarding speedy drawing exercises, cognitive awareness, and contiguity with reality, there might be more that what the eye sees: The parallels of synchronicity and recent investigations in quantum physics, seem to indicate that some physicists are increasingly accepting the idea that there exist an infinity of realities stacked together. The most preposterous theory reconciling the difference between the microscopic world of atoms and the macroscopic everyday world was proposed in 1957 by Hugh Everett III. His *Many Worlds Interpretation* is an approach to quantum mechanics according to which, in addition to the world we are aware of directly, there are many other similar worlds, which exist in parallel at the same space and time.
See:
Marcus Chow, *The Universe Next Door: Twelve Mind-blowing Ideas from the Cutting Edge of Science*. London: Review, 2003
- Vaidman, Lev, "Many-Worlds Interpretation of Quantum Mechanics", *The Stanford Encyclopedia of Philosophy (Summer 2002 Edition)*, Edward N. Zalta (ed.),
URL<<http://plato.stanford.edu/archives/sum2002/entries/qm-manyworlds/>>.
- Max Tegmark & John Archibald Wheeler, " 100 Years of the Quantum" *ScientificAmerican*, (Feb. 2001): p.68-75