Title: **Senses & Sensibility'15: Design as a Trade**
Proceedings of the UNIDCOM/IADE 8th International Conference

Editors: **Emília Duarte**
Carlos Duarte
Fernando Carvalho Rodrigues

Collection: **Proceedings book of UNIDCOM / IADE Conferences**

Publisher: **IADE - Creative University / Edições IADE**

First Published: **September 2015**

ISBN **978-989-8473-18-9**


8th
senses&sensibility'15
design as a trade

Contents

10 **Committees**

15 **Coordination and Chairs**

16 **Keynote Speakers**

17 **PARALLEL SESSION 1 »»» DESIGN AND TECHNOLOGY**
Panel chair: Nelson Zagalo

19 **The Game of the Interior.**
Ulf Holler, Atelier R10, Netherlands

25 **Play Design! Designing games to teach design.**
Mauro Ceconello, Alessandra Spagnoli, Davide Spallazzo and Umberto Tolino

33 **Gamification in Healthcare Contexts** (Abstract only)
Pedro Pereira and Emília Duarte

34 **A theoretical framework for addressing Little Design Up-Front in Agile projects settings.**
Farley Fernandes and André Neves

42 **Anticipated experience: the influence of the brand's image in the user's relationship with the mobile application Spotify.**
Mauricio Dick, Luciano Schmitt, Luiz Gomez, Berenice Gonçalves and Ricardo Triska,

50 **Design and ergonomic studies: challenges during management and development of new projects.**
Marcos Lima, Andréa Meneghetti Zatta, Luis Carlos Paschoarelli and Fausto Orsi Medola

57 **PARALLEL SESSION 2 »»» DESIGN AND SUSTAINABILITY**
Panel chair: Ana Margarida Ferreira

59 **Social sustainability for the chain of production and marketing in the Third Sector of the economy: the case of the solidarity craft dolls from Gravatá-PE, Brazil.**
Tibério Tabosa, Ana Maria Andrade, Virginia Cavalcanti and Marcia Jordao

67 **An Empirical Investigation to Understand Sustainable Fashion Purchase Intention.**
Ana Rita Gonçalves, Joaquim Casaca and Carlos Rosa

75 **Directions towards sustainability through higher education.**
Theresa Lobo

83 **Establishing a language process in social design.**
Lucy Niemeyer and Stella Hemida

89 **Cool sustainable toy: designing pedagogic and innovative product through an emotional approach.**
Paula Marques and Ana Margarida Ferreira

97 **The sustainable indicators in Communication Design.**
Maria Cadarso

105 **PARALLEL SESSION 3 »»» FASHION AND TEXTILE DESIGN**
Panel chair: Fernando Moreira da Silva

107 **Design and creativity as a constructive reference for a fashion accessories system associated with urban mobility.**
Bárbara Costa, Liliana Soares and Nuno Domingues

114 **The genius loci as disseminator of culture and creativity in the bio jewelry design.**
Andreia C. Cunha, Liliana Soares and Ana Sofia Rodrigues

121 **Future Studies: a Methodology for Fashion Research.**
Sandra Rech

128 **From Nereid to Artemis: the mythical representation in fashion advertising.**
Amanda Campos, Richard Perassi and Luiz Salomão Ribas Gomez

136 **Material research to develop a t-shirt with cardiac monitoring.**
Andrea Meneghetti Zatta, Jeferson Genaro Gomes, Alexandre C. Ferri and Tony P. Novaes

144 **Aesthetic Contributes to Fashion Design using Special Dyes in Textiles.**
Jose Machado, Jose Lucas, Francisco Franco, Rui Miguel, Liliana Ribeiro, João Barata and Madalena Pereira

151 **PARALLEL SESSION 4 »»» DESIGN AND SOCIETY**
Panel chair: Rodrigo Cunha

153 **Science as Reference and Practical Knowledge: a Philosophical Approach to Design.**
Washington Dias Lessa

161 **Design and the Language Instinct.**
Yoad David Luxembourg and Heitor Alvelos

169 **Communication/Design constructs reality: a matter of points of view.**
João Barata, Rui Miguel, José Lucas, Madalena Pereira, José Machado and Manuel Silva

176 **Globalization of International Property Rights Applicable to Creators: Law and practice.**
Cristina Caldeira

181 **The meaning of design.**
Rodrigo Cunha

183 **Ephemeral Constructions in the Context of the Baroque Period Festivities: an Aesthetic of Enchantment.**
Anabela Couto

189 **PARALLEL SESSION 5 »»» DESIGN FOR SOCIAL IMPACT**
Panel chair: Lucy Niemeyer

191 **Conceptual and Methodological Aspects in the Technological Innovation Process: Design as a Strategic Tool.**
Pablo Bezerra, Amilton Arruda, Isabela Moroni, Celso Hartkopf and Aurileide Alves

198 **Designing Ideas: a project in social design within an educational framework.**
Ana Nolasco

204 **Placing toilets in sustainable design – the need for social and technological innovation.**
Laura Korčulanin, Carlos Barbosa and Ana Margarida Ferreira

212 **Affordance, Semantic Object and Intuitiveness: A review focusing on Design.**
Jamille Noretza de Lima Lanutti, Sérgio Tosi Rodrigues, Luis Carlos Paschoarelli and Gabriel Henrique Cruz Bonfin

220 **What difference does a designer make in Brazilian craftsmanship?**
Carla Paoliello and Márcia Enrige Nobre

228 **Innovation, Design and Cultural Changes: the Contributions of Cultural Triangulation as a Trend Forecasting Methodology.**
Douglas Menegazzi, Laryssa Tarachucky, and Luiz Salomão Ribas Gomez

235 **PARALLEL SESSION 6 »»» DIGITAL DESIGN**
Panel chair: Hande Ayanağlu

237 **Experience Design and Wine List Innovation.**
Ana Filomena Curralo

245 **Digital interaction and tangible experiences: a theoretical investigation.**
Chiara Lecce

253 **The challenge of designing for modern healthcare digital systems.**
Claudia Pernencar

261 **Material Design in Visual Analytics: A Systemic Design Approach to Data.**
Laura Sadanha

267 **The active archive: new strategies for protection and fruition.**
Ana Gallo

273 **Using virtual environments in basic design education.**
Ana Glória and Emília Duarte

281 **PARALLEL SESSION 7 »»» BRAND DESIGN**
Panel chair: Daniel Raposo

283 **Developing a brand experience: the step "X" of TXM Branding Methodology.**
Valéria Casaroto Feijó, Luiz Salomão Ribas Gomez, Pablo Eduardo Frandoloso and Marília Matos Gonçalves

291 **The Brand JIT Model: Just-in-Time Sync Metrics for Brand Development and SMEs Innovation.**
Carlos A. Rosa

299 **The P&G's Brand Purpose Communication in Digital Advertising.**
Dayane A. Lopes, Sarah S. Schmiegelow, Luiz Salomão R. Gomez and Richard Perassi

307 **Narrative constructions for brand: the use of archetypal storytelling in branding.**
Dayane Alves Lopes, Luiz Salomão Gomez and Marilia Gonçalves

314 **City Brand Experience: Urban Trends and Aesthetic Experiences from the Perspective of City Branding.**
Priscilla G. Lopes, Clarissa Martins Alves, and Luiz Salomão Ribas Gomez

322 **Achieving the Place Brand DNA – the case of Florianopolis' innovation sector.**
Laryssa Tarachucky and Luiz Salomão Ribas Gomez

329 **PARALLEL SESSION 8 »»» DESIGN AND EDUCATION**
Panel chair: Helena Souto

331 **Neutral Spaces. The Close Relationship Between Professional and Educational Spaces.**
Roberta Franceschi, Lucinda Morrissey, Adolfo Jordan and Maria Jesús Triviño

339 **Coworking as a Stigmergic and Informal Learning Space.**
Fernando Mendes and Carlos Duarte

346 **Design Research Diagnostic Practice Implementation in Classroom Context.**
José M. Gago Silva

353 **One Day of the Designer: Exploring Students' Perspectives on the Relationship between Individual and Collaborative Work in Design Process.**
Pinar Kaygan, Emre Çağlar, And Özümcan Demir

361 **Lost in Representation - Designing mistakes in the Design.**
Filipa Barradas

366 **The Designer as a Culture Agent.**
Cátia Rijo

371 **PARALLEL SESSION 9 »»» DESIGN, MARKETING AND INNOVATION**
Panel chair: Salomão Gomez

373 **Developing a scale measuring Organizational Happiness for communication and information professionals: content analysis and exploratory factorial analyses.**
Georg Dutschke, Joaquim Casaca, Carlos Alves Rosa and Ana Loureiro

381 **Marketing communications model for innovation networks.**
Tiago Correia, Américo Mateus and Susana Leonor

389 **Total market orientation, marketing effectiveness and organizational innovation.**
Patrícia Pereira, António Pimenta da Gama and Joaquim Casaca

397 **The Perspective of a Local Business about the Design Management and Visual Merchandising: Analysis of Café François.**
Grasiele Pilatti, Luiz Salomão Ribas Gomez and Eugenio Merino

404 **Memes and symbolic interactionism: a new approach to trend research and design.**
Amanda Campos, Luiz Salomão Ribas Gomez

412 **Eclat Precedes form: The Ontology and Perception of Bright Objects.**
Tufan Orel

421 **PARALLEL SESSION 10 »»» DESIGN AND VISUAL CULTURE**
Panel chair: Carlos Rosa

423 **Visual culture as commodity.**
Armando Vilas-Boas

429 **Advertising as a tool of methodology TXM: Case john-john.**
Leandro Werner Ribeiro and Luiz Salomão Ribas Gomez

435 **Displaying Portuguese Graphic Design through Art: the "Art on Chairs" Project.**
Helena Barbosa

443 **Storyteller or 'storybuilder' picture stories.**
Isabel Farinha and Jorge Augusto Feldens

448 **What do we mean by 'visual culture'?**
Armando Vilas-Boas

454 **On Architecture as Project-oriented Method and a Visual Art; from Scientific Aesthetics, to a Science of Design – A Case Study.**
Sandra S. Antunes and Helena Souto

463 **PARALLEL SESSION 11 »»» DESIGN AND VISUAL CULTURE**
Panel chair: Cristina Pinheiro

465 **A Transdisciplinary Perspective for the Design Process: A Comparative Review.**
João Filipe Figueiredo, Nuno Correia, Inês Ruivo and Jorge Lino

473 **Shape and Material Analysis of Water Bottle Containers.**
Pedro Oliveira

481 **Perception of Sustainability through Plastic Household Package Materials.** (Abstract Only)
Maria João Ambrósio, Hande Ayanağlu, Júlia Teles and Emília Duarte

482 **Colour in Portuguese Water Bottle Containers.**
Pedro Oliveira

490 **MADEC. Material Design Culture.**
Marinella Ferrara and Chiara Lecce

498 **Craftwork in brazil: dialogues with tradition and contemporaneity.**
Silvia Sasaoka and Mônica Moura

Committee

Honour Committee

Clive Edwards
Emeritus Professor of Design History, School of the Arts, Loughborough University, UK

José Augusto França
Professor Catedrático Jubilado da Universidade Nova de Lisboa, Portugal

Oliveira Viegas
Vice-Almirante, Diretor da Comissão Cultural de Marinha, Portugal

Basílio Horta
Presidente da Câmara Municipal de Sintra, Portugal

Scientific Committee

Afonso Pinho Borges
Departamento de Comunicação e Artes, Universidade da Beira Interior, Portugal

Ana Amélia Carvalho
Faculdade de Psicologia, Universidade de Coimbra, Portugal

Ana Margarida Ferreira
IADE-U – Instituto de Arte, Design e Empresa – Universitário, Portugal

Ana Maria Fernandez Garcia
Historia del Arte e Musicologia, Universidad de Oviedo, Spain

Anabela Galhardo Couto
IADE-U – Instituto de Arte, Design e Empresa – Universitário, Portugal

António da Cruz Rodrigues
IADE-U – Instituto de Arte, Design e Empresa – Universitário, Portugal

António Nunes Pereira
IADE-U – Instituto de Arte, Design e Empresa – Universitário, Portugal

António Pimenta da Gama
IADE-U – Instituto de Arte, Design e Empresa – Universitário, Portugal

Armando Vilas-Boas
IADE-U – Instituto de Arte, Design e Empresa – Universitário, Portugal

Carlos Alves da Rosa
IADE-U – Instituto de Arte, Design e Empresa – Universitário, Portugal

Carlos Duarte
IADE-U – Instituto de Arte, Design e Empresa – Universitário, Portugal

Organizing Committee

Conference Chairs

Emília Duarte
IADE-U, Portugal (General Chair)

Carlos Duarte
IADE-U, Portugal

Fernando Carvalho Rodrigues
IADE-U, Portugal

Local Organ. Committee

Ana Glória Neves
Fernando Martins
Catarina Lisboa
Hande Ayanoglu
Laura Saldanha
Fernando Mendes
Pedro Pereira
Lara Reis
Luís Teixeira
Paula Marques
Eduardo Gonçalves
Vasco Milne

Graphic Design

Maria Cadarso [Art Direction]

Students Design Team:
Mariana Queiroga [Illustrations and leading the work]
José Alvarez [leading the work]

Bruno Veiga
Gonçalo Gameiro
Miguel Athayde de Tavares
Ruben Martins

Pedro Pereira

Web Design and UX

Bruno Nobre [Web Design coordinator]
Manuela Pinto
Rita Boto
Tiago Laginha

Coordination and Chairs

Coordination

Emília Duarte,
IADE-U, Portugal

Conference Chairs

Emília Duarte
IADE-U, Portugal

Carlos Duarte
IADE-U, Portugal

Fernando Carvalho Rodrigues
IADE-U, Portugal

Conference Session Chairs

Parallel Session 1 - Design and Technology
Nelson Zagalo, UMinho, Lisboa (to be confirmed)

Parallel Session 2 - Design and Sustainability
Ana Margarida Ferreira, IADE-U, Portugal

Parallel Session 3 - Fashion and Textil Design
Fernando Moreira da Silva, FA/UL, Portugal

Parallel Session 4 - Design and Society
Rodrigo Cunha, IADE-U, Portugal

Parallel Session 5 - Design for Social Impact
Lucy Niemeyer, UERJ, Brazil

Parallel Session 6 - Digital Design
Hande Ayanoglu, IADE-U, Portugal

Parallel Session 7 - Brand Design
Daniel Raposo, ESART/IPCB, Portugal (to be confirmed)

Parallel Session 8 - Design and Education
Helena Souto, IADE-U, Portugal

Parallel Session 9 - Design, Marketing and Innovation
Salomão Gomez, UFSC, Brazil

Parallel Session 10, Design and Visual Culture
Carlos Rosa, Universidade Europeia, Portugal

Parallel Session 11 - Design Processes
Cristina Pinheiro, IADE-U, Portugal

Keynote Speakers

Pieter Desmet
Faculty of Industrial Design of Delft University, The Netherlands

Is Full Professor of Design for Experience at the Faculty of Industrial Design of Delft University in The Netherlands. He chairs a research group that focuses on emotion- and well-being-driven design. Desmet is board member of the International Design for Emotion Society and program director of the Design for Interaction Master's programme. In 2012, he co-founded the Delft Institute of Positive Design, a scientific institute that stimulates and initiates the development of knowledge that help designers in their attempts to design for human flourishing. Besides his research, he contributes to local community projects, such as a recently developed sensory wellness neighbourhood park, and a cultural Rotterdam-based "House of Happiness."

Gabriel Patrocínio
Universidade do Estado do Rio de Janeiro, Brazil

Designer and design activist, graduated from ESDI (Rio de Janeiro) in 1982, and got his PhD from Cranfield University, UK (2013). His thesis on public design policies received in 2014 a first prize at the 28th Award of Museu da Casa Brasileira. Associate professor and founder of the Design Policies Lab at IFHT/UERJ (dplab.rio). He is member of the board of the Association of Graphic Designers (ADG-Brasil) and from the Design Curatorial Board at MAM-RJ. Has also been a member of the consulting board from the Brazilian Association of Design Businesses (Abedesign), and from the advisory design board at the Secretary of Development from the State of Rio de Janeiro, as well as professor (from 1983), vice-director and director of ESDI (2000-2008). Has an extensive experience as an international conferencist in the field of design and innovation and as a consultant on intellectual / industrial property.

Joan Costa
Elisava, Barcelona

Costa es diseñador, sociólogo, investigador y metodólogo. Es uno de los fundadores europeos de la Ciencia de la Comunicación Visual. Consultor corporativo, asesor de empresas en diferentes países. Costa es econocido como el comunicólogo número uno del mundo. En 1987 crea y dirige en Barcelona la Enciclopedia del Diseño, primera del mundo en su género, donde el autor reivindica las escuelas europeas de diseño en contraste con la escuela norteamericana y la japonesa. Es doctor honoris causa por la Universidad Jaume I, de Castellón, España; la Universidad Empresa Siglo 21, de Córdoba, Argentina, y la Universidad Peruana de Ciencias Aplicadas, de Lima. Autor de más de 40 libros, ha creado y dirige el Máster Internacional DirCom; Máster Internacional en Diseño de Comunicación Visual; Máster Internacional en Design Management; MasterBrand Internacional, entre otros.

Loredana Di Lucchio
Sapienza University of Rome, Italy

Ph.D., Researcher Professor in Design at Sapienza Università di Roma. Her research and teaching activities, as well as, her essays and conference papers, are focused on the relationship between production and consumption in contemporary societies within a convergence between the approaches of the Strategic Design, Product Design and Design for User Experience. Currently, she is: Scientific Coordinator of the Research Laboratory 'Sapienza Design Factory' which is focused of Design for Rapid Manufacturing and Research Supervisor of the Laboratory of 'Usability and Accessibility' which is focused on Design for User-Experiences. She is also Editor in Chief of Scientific Journal 'Planning, Design, Technology' published by RDesignPress and Co-Editor of the scientific journal 'Design Principles and Practices' published by Common Ground Publishing

Digital Interaction and Tangible Experiences: A Theoretical Investigation

Chiara Lecce[a]

[a] *Department of Design, Politecnico di Milano*
Milan, Italy
chiara.lecce@polimi.it

ABSTRACT

Within other disciplines, the merging of physical form with digital contents and behaviors occurred alike. Product Design increasingly concerns complex computational behavior and designers need to rethink how to make IT-related appliances legible and usable. Design researchers have come to investigate how form and digital behavior can be more closely coupled and how users could interact in richer ways with digital products. Therefore this paper would trace a theoretical dissertation about the evolution of HCI technologies and interaction design approaches focusing on the principal steps that brought toward a more direct connection with "materiality" and perceptual values. In particular, a specific attention is dedicated to a new emerging vision called Smart Material Interfaces (SMIs), which takes advantage of the latest generation of engineered materials that has a special property defined "smart". The paper would also outline the necessity of a in deep understanding of the correspondent roles attributed to designers, interaction designers, smart materials engineers or life sciences experts and the fundamental necessity of open knowledge systems that can help to get more clear and transparent visions about complex smart technologies. The specific case here supported is how material and tactile surfaces represent a new interaction design direction toward more spontaneous and "make it easier" human-friendly interfaces.

Keywords: Human Material Interactions, Smart Material Interfaces, Organic User Interface, Multimodal Interfaces.

INTRODUCING THE TOPIC

With the increasing penetration of the Internet in the late 90s, the advent of home and leisure computing, and eventually the emergence of digital interactive consumer products, the two cultures of design and engineering gravitated towards a common interest in discretionary use and user experience. Towards the turn of the century, the notion of interaction design - which covers only a part of the Human-computer interaction (HCI) field - started to gain in popularity as a way to acknowledge a more design-oriented approach to the topic, going beyond pure utility and efficiency to consider also aesthetic qualities of use, for example. (Lowgren, 2014) Since then, a plethora of professional practices, academic study programs, literatures, networks and venues have formed under the umbrella of interaction design and consequently there are many different understandings of exactly what interaction design is.

Gillian Crampton Smith in 1989 set up the Computer Related Design Department with advice from Bill Moggridge at the Royal College of Art (now called the Interaction Design Department), this was the first program in the world where graduate designers could learn to apply their skills to interactive products and systems. In 2001 she moved to Ivrea (sponsored by Olivetti company) to establish the Ivrea Interaction Design Institute, which offered the world's first post-experience interaction design program. She stated: "In the same way that industrial designers have shaped our everyday life through objects that they design for our offices and for our homes, interaction design is shaping our life with interactive technologies - computers, telecommunications, mobile phones, and so on. If I were to sum up interaction design in a sentence, I would say that it's about shaping our everyday life through digital artefacts". (Smith, 2002)

Since then digital design and production processes are simulating and integrating material and environmental conditions, while addressing innovative methods of conception and physical realization of ideas at all scales. This has opened rich areas of research in design and important crosspollinations and multidisciplinary approaches that reinforce and expand the connections between practitioners, industry, and academia. It is a challenge to creativity, rigor, and exploration, but also a product of an increasingly complex understanding of what design is, of what designers can produce, and their relation to the material and physical conditions of the built environment. It is also fundamental to understand how the development of digitally enhanced products and spaces is affecting our experiences at all scales.

From technology-driven to sensory experiences

Mark B. N. Hansen begins his paper (2011) talking about how technology-driven sensation has traditionally focused on the visual domain, which is now being replaced by temporality. "The desire to expand human sensory capacities has long informed the development of technology. From the telescope to the photographic camera to contemporary machine vision and infrared systems, technologies for expanding vision have made formerly imperceptible domains of sensation accessible to human experience."(Hansen, 2011) Hansen then explains that ubiquitous computational environments address us at a microtemporal level since by definition, it is invisible to perceptual consciousness. He cites Mark Weiser[1] and John Seely Brown[2] who emphasize the fact that computers will become more "invisible", fade into the background, and take care of humanity's "unconscious details". He also notes the shift of the "sensory address" that comes with ubiquitous computing: away from the centrally-framed computational object (PCw/screen) towards the "periphery". Weiser and Brown talk about this a lot when they discuss *calm technology*, which always moves back and forth between periphery and centre, allowing us to "attune to many more things than we could if everything had to be at the centre". (Hansen, 2011) In his book *Digital Ground* (2005), Malcolm McCullough states, "Notions of what a computer is have not kept pace with realities of how digital systems are applied." The use of computers has evolved from its origins in mainframe computing and one computer for many users to the current age of desktop computing, with a one-to-one ratio of computers to users.

Semiotics has helped designers to understand how design images create a culturally shared visual language that is ordered and read like a sentence. The work of Saussure (1974) emphasized language as the primary method of analysing elements of human experience translated into words and organized semantically to communicate meaning between individuals and cultures. Semiotics investigates exactly how language serves as a symbolic signifier of the external world and also expresses the internal human understanding of it through culturally accepted signified meanings. The signs that result when signifiers and signified meanings match allow for shared communication of meanings within and between cultures. This implies that design is capable not only to contain existing meaning (expressing old ideas) but also to create meaning (expressing new ideas) as well.

An additional process through which human response to environment can be explored is that of phenomenology. Phenomenology has helped designers to understand how an individual's own perceptions, thoughts, and feelings form their unique interpretations of environment. Husserl believed that the individual perceives and discovers subtle intuitions by which they create a meaningful world through their own will. If so, human understanding of the world is not experienced exclusively as the objective data provided by cultural symbols, but also includes an individual's unique interactions with the world based on personal experience, feeling, and memory. According to Bachelard (1969), "thought and experience are not the only things that sanction human values (…) values that belong to daydreaming mark humanity in its depths and dwelling-places of the past remain in us for all times as the repository of memories". Those who study the environment as it appears phenomenologically train themselves to a high level of environmental sensitivity-an ability to "reduce consciousness" or to focus-in order to record their own specific responses. Heightened environmental awareness also includes spontaneous multisensory perceptions in which the deeply internalized experience of random physical stimuli merges to form one's precognitive reality: "Sensory experience is indeed central in aesthetic perception, and receives even greater emphasis when we engage with environment. We not only see our living world; we move with it, we act upon it and in response to it. We grasp places not just through color, texture, and shape, but with the breath, by smell, with our skin, through our muscular action and skeletal position, in the sounds of wind, water and traffic". (Berleant, 1992) Knowing this may help designers to understand human responses by understanding why someone perceives or assigns meanings as one does. A designer also understands that the lived experience of a design affects the persons involved in some way. Understanding affective experience is difficult because an environmental participant's state of mind is influenced by various hidden elements. This requires that a designer build some degree of flexibility or indeterminacy into a design solution.

The term "embodiment" does not simply state the fact that humans have bodies. It has been shown that even a change in posture, while maintaining identical sensorial stimulation, alters neuronal responses. (Varela & Thompson, 1992) Embodiment is the relationship between meaning and action, and "the process of grasping a meaning is performed by the body." (Merleau-Ponty, 1962) Thus, the methods for making sense of action and the methods for engaging in it are the same methods. (Dourish, 2001) This argument for embodiment comes from the philosophy of phenomenology, which focus on the world as it is lived in and experienced, not

[1] Mark D. Weiser was a chief scientist at Xerox PARC (United States). Weiser is widely considered to be the father of ubiquitous computing, a term he coined in 1988.

[2] John Seely Brown, also known as "JSB", is a researcher who specializes in organizational studies with a particular bent towards the organizational implications of computer-supported activities.

the world, as it appears when we stop acting and start thinking about it. (Loren & Dietrich, 1997) Understanding the world as the experience of an embodied mind creates a strong connection between person and their environment.

Transformations involving the new media society have been mixed in the digital convergence: natural human perceptions have been amplified using communication technologies and real spaces have become more sensible for users in an invisible way. The aim of the digital convergence should be to bring near in time and space invisible realities and live realities.

Multiple streams of research and design suggest that the question of relation between the physical and digital has given rise to a fundamental and basic concern for materials within the context of computing. *Ubiquitous computing, tangible interactions,* and *computational materiality* represent strategies for accomplishing full integration of the digital and physical. Mark Weiser´s insight, that computers might be seamlessly integrated into the world, marked an important overture in what might be called a "material turn". (Weiser, 1991) By decoupling computing from the computer, *ubiquitous computing* made visible new strategies for bridging the digital and physical. At its best, ubiquitous computing motives a design sensibility that gives rise to new ways of thinking about the aesthetics of calm computing. (Robles & Wiberg, 2010)

"Super technology is going to ask for super tactility", interiors and products will need more tactile designs as the use of computers and screens makes us crave a sense of touch, trend forecaster Li Edelkoort predicts in this last movie filmed at Dezeen Live. "The more screens we have the more our figures are afraid we're going to disappear", she says. "I feel it already in my fingers that they want me to touch lots of things so I don't loose contact with touch". (Edelkoort, 2012) Therefore she predicts that textiles will be increasingly important in interior design, supporting the increasingly nomadic lifestyle that mobile technology permits. One of the strongest long-term trend of the future is probably the *hybridization* .We will navigate at the border of organic & digital, intuition & interface. The way the body senses is referred to as the *tactual* sense, which consists of the tactile sense and the kinesthetic sense. The tactile, or cutaneous sense refers to awareness of stimulation to the skin. The kinesthetic, or proprioceptive sense refers to the awareness of limb positions, movements, orientation and muscle tension. The tactual forms the basis of our ability for spatial perception.

TOWARDS NEW VISIONS FOR INTERACTION DESIGN

As a result of the widespread use of personal computers and programmable objects (machine tools and appliances), Interaction Design acquired an increasingly important aspect in the design discipline. Born in the specific field of computational IT under the HCI (Human-Computer Interaction) its development trajectory has inevitably cross design approach in order to facilitate the use of software and improve user-product interaction. The interface, defined as the scene where the interaction happens (Anceschi, 1993), ranging from the simple exchange of information to more complex relationships, has attracted the interest of visual communication designers for GUIs (Graphical User Interface) promoting the role of design both for computational and aesthetic dimensions of interaction, through visual design methods, surfaces design, adapting atmospheres between man's body and technological equipment, in order to open "perceptual doors" and to "bridge ergonomic toward action". This includes the design of a textual, gestural and oral interface language, hence the concept of a "natural interaction", which emphasizes that user articulation requests can be very similar to actions performed spontaneously in the physical world. Another acquisition was the idea of Bill Moggridge and Bill Verplank from IDEO that interaction design consists of designing the experiences deriving from the relation between the user and the digital interactive tool (*user experience*) on the basis of a *human-centered* approach.

Today, due to its short history, Interaction Design as a professional field is living a process of continuous skills upgrading, but a general position in the interaction design methodology agrees that interface usability alone is not enough to determine the user's liking. Usability can be high and meet standards already defined, but it does not give sufficient sensory gratification, or could not completely perform the tasks expected by the users during its application. In order to define this "quality of interaction" several interdisciplinary researches have been undertaken (cognitive psychology, ergonomics, semiotics, etc.), trying to analyze the phenomena that occur during the user-interface contact. Therefore, also physiological measures (skin conductance, electroencephalogram, electromyography, etc.) are taken into account to better understand and demonstrate (often by experimental psychology methods) which variables of the interface or of the user's profile affect the various aspects of the interaction.

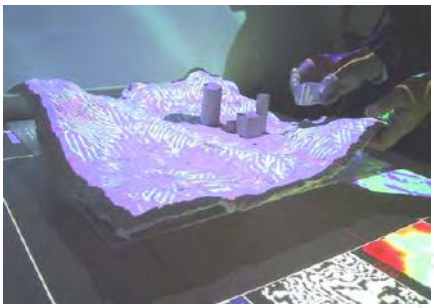
In a wide variety of studies and different points of view, the design approach to interaction has been shown as one of the most highly user-oriented. This approach is based on the primary role of the interactive experience. This depends on a number of fundamental choices that have a profound aesthetical nature. The interactive experience of a specific user, during the interaction with a technical device, depends on the involvement of

all the senses, from the evolution of values and meaning of use, within a precise framework of social, material and cultural backgrounds, according to a holistic design approach. (Battarbee, 2007) Starting from this vision, interactive experience is supported by the studies that intend to enhance sensory experiences with interfaces through the interactive objects physicality. Several researches underlined that the physical and emotional dialogue between an interface and its user, this dialogue is expressed in the dynamic interplay between form, function, and technology. (Kolko, 2011) Hallnäs and Redström (2006) stated that interaction design can no longer be considered only as a subfield of computer science, but a link between basic research in computer science and product applications for new expressive design materials. Experience design encompasses the design of interaction through the involvement of all the senses and, to include the quality of interaction, also involves many disciplines such as perceptive and cognitive psychology, cognitive sciences (neuropsychology), linguistics, and semiotics. This complex methodological approach has been developed for software design, web applications, and digital devices. Today, experience design is one of the new focal points for product design research and smart materials applications.

From tangible to material: from TUIs to HMI and SMIs

Brygg Ullmer and Hiroshi Ishii[3] (1997), took an important step towards describing a new conceptual framework with their discussion of "graspable user interfaces". Building upon this foundation, they extended these ideas and proposed the term "Tangible User Interfaces" (TUI). Among other historical inspirations, we suggested the abacus as a compelling prototypical example. In particular, it is key to note that when viewed from the perspective of human-computer interaction (HCI), the abacus *is not an input device*. The abacus makes no distinction between "input" and "output." Instead, the abacus beads, rods, and frame serve as manipulable *physical representations* of numerical values and operations. Simultaneously, these component artifacts also serve as *physical controls* for directly manipulating their underlying associations. (Ishii & Ullmer, 2001) This seamless integration of representation and control differs markedly from the mainstream graphical user interface (GUI) approaches of modern HCI. Graphical interfaces make a fundamental distinction between "input devices," such as the keyboard and mouse, as controls; and graphical "output devices" like monitors and head-mounted displays, for the synthesis of visual representations. Tangible interfaces, in the tradition of the abacus, explore the conceptual space opened by the elimination of this distinction. (Ishii & Ullmer, 2001)

When in 2012 the MIT Tangible Media Group presented the paper (Ishii, Lakatos, Bonanni, Labrune, January 2012), established a new step in the user-interface relation. In fact, although the tangible representation (TUI) allows the physical embodiment to be directly coupled to digital information, it has limited ability to represent change in many material or physical properties. Unlike with pixels on screens, it is difficult to change the form, position, or properties (e.g., color, size, stiffness) of physical objects in real time. This constraint can make the physical state of TUIs inconsistent with underlying digital models (Fig.1-2). Interactive surfaces are a promising approach to supporting collaborative design and simulation to support a variety of spatial applications. Tangible interfaces are deeply concerned with the topic of representation that crosses physical and digital domains.



Figures 1-2. Images from "Continuous Tangible Interfaces: Bringing Clay and Sand into Digital Design" a TUI project by Hiroshi Ishii, Assaf Biderman and Carlo Ratti. The tangible worktable is comprised of a landscape model, which is augmented by computer projections. In the Illuminating Clay case, any object from the user's environment can be used as an input/output mechanism, including the user's own hands, pieces of paper, cardboard, foam, plastic or other objets trouvés. (Ishii, Biederman, Ratti, 2004)

Radical Atoms takes a leap beyond tangible interfaces by assuming a hypothetical generation of materials that can change form and appearance dynamically, so they are as reconfigurable as pixels on a screen. Radical

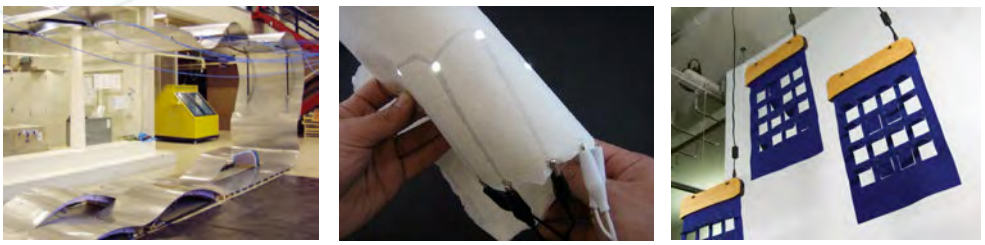
[3] Hiroshi Ishii, "Jerome B. Wiesner Professor" of Media Arts and Sciences, Associate Director of MIT Media Laboratory, Co-Director of Things That Think (TTT) Consortium Head of Tangible Media Group Massachusetts Institute of Technology.

Atoms is a vision for the future of *Human-Material Interactions* (HMI), in which all digital information has physical manifestation so that we can interact directly with it - as if the iceberg had risen from the depths to reveal its sunken mass. (Ishii, Lakatos, Bonanni, Labrune, January 2012) The paper conclusions underline the experimental vision (*Vision-Driven Design Research*) of this design approach: "We may call these human-material interactions (HMIs) or material user interfaces (MUIs), in which any object—no matter how complex, dynamic, or flexible its structure—can display, embody, and respond to digital information. Even though we may need to wait decades before atom hackers (material scientists, self-organizing nano-robot engineers, etc.) can invent the enabling technologies for Radical Atoms, we believe the exploration of interaction design techniques can begin today." (Ishii, Lakatos, Bonanni, Labrune, January 2012)

An example is the project titled *TRANSFORM* by MIT Media Lab (Vink et al., 2015), which is an exploration of how shape display technology can be integrated into our everyday lives as interactive, shape changing furniture. These interfaces not only serve as traditional computing devices, but also support a variety of physical activities. By creating shapes on demand or by moving objects around, *TRANSFORM* (Fig.3) changes the ergonomics, functionality and aesthetic dimensions of furniture.

Figure 3. Transform is made up of over 1,000 plastic rods attached to individual motors. When someone passes their hand over the table top, sensors detect the movement and cause the surface to ripple like a wave. Photo Credits: Tangible Media Group.

A relative precedent publication titled *Programming Reality: From Transitive Materials to Organic User Interfaces* (Coelho et al., 2009), face the same arguments. They observe how emerging technologies like Flexible E-Ink, OLED displays, shape-changing materials, parametric design, e-textiles, sensor networks, and intelligent interfaces promise to spawn entirely new user experiences that will redefine our relationship with technology. "In one example, future displays will allow us to design devices that are completely flexible and can curve around everyday objects and our bodies. New actuating technologies will also allow for 'claytronic'-type devices and materials that can actively re-shape themselves on multiple scales: from hand-held gadgets to entire buildings. On the input side, new sensor technologies allow us to track the position of multiple fingers, twists and pressure on surfaces of any shape. These and other developments are opening up unprecedented opportunities for innovation and require us to reexamine and re-evaluate some of the most basic user interface design principles ". (Coelho et al., 2009) The paper describes the results of a workshop (Fig.4-5-6) based on two converging themes related to these developments: *Transitive Materials* and *Organic User Interfaces*. *Transitive Materials* investigate how emerging materials and computationally-driven behaviors can operate in unison. *Transitive materials* combine the transient qualities of smart, composite, and computational materials, and encapsulate the ability to function as frame, skeleton, sensor, actuator and/or processor. The multifaceted nature of transitive materials provides a link between computational devices and physical material elements. Organic User Interfaces (OUIs) explore future interactive designs as computationally controlled materials become commonplace. The OUI vision is based on an understanding that physical shape of display devices will become non-flat, potentially arbitrary and even fluid or computationally controlled. This allows display devices and entire environments to take on shapes that are flexible, dynamic, modifiable by users or self-actuated. (Coelho et al., 2009)



Figures 4-5-6. Projects from the Programming Reality workshop (2009) form the left: *Re-configurabe* architectural spaces; composite combining natural paper and electronic components; shape changing textile surface for environmental control and communication.

In 2012 Andrea Minuto, Dhaval Vyas, Wim Poelman and Anton Nijholt presented their paper *Smart Material Interfaces: A vision*, describing a further vision according to the HMIs theory. Smart Material Interfaces (SMIs) takes advantage of the latest generation of engineered materials that has a special property defined "smart". They are capable of changing their physical properties, such as shape, size and color, and can be controlled by using certain stimuli (light, potential difference, temperature and so on). They affirm that one of the major limitations of TUIs is that they focus more on the input mechanism and less on the output. Instead, the main focus of a SMI is being able to make changes in the physical and material properties of output modalities. SMI proposes the use of materials that have inherent or "self augmented" capabilities of changing physical properties such as color, shape and texture, under the control of some external stimulus such as electricity, magnetism, light, pressure and temperature. (Minuto, Vyas, Poelman and Nijholt, 2012)

SMI sustains three principal statements: the first one concerns the need to make the vision of *ubicomp*, as conceived by Mark Weise (1991), more relevant. The central idea behind the vision of *ubicomp* is to seamlessly embed computing in the everyday used objects, both socially and procedurally. The material qualities of these everyday objects play a big role in the social and procedural practices of people. In the current *ubicomp* research, the material and the computation are seen detached from each other. (Vallgårda & Redström, 2007; Minuto, Vyas, Poelman and Nijholt, 2012) Electronic components are seldom integrated into objects' intrinsic structure or form. There is a need to highlight the blurring boundaries between the material qualities of an object and the computational functionalities it is supposed to support. (Buechley & Coelho, 2011) Second, the technology push from different fields of material sciences has provided new possibilities to integrate materials such as metals, ceramics, polymeric and biomaterials and other composite materials for designing products. A wide range of smart materials[4] can be seen in the literature that can change their shape, size, color and other properties based on external stimuli. These properties of smart materials can be used to create new kind of interaction and interfaces. (Minuto, Vyas, Poelman and Nijholt, 2012) Third: use of screen-based interfaces has dominated the user interfaces for several years now. These use icons, texts, and other types of widgets to support communication with users. Smart materials can introduce new semantics to the human-computer interaction, which focuses on change of shapes, colors, size or positioning. Of course, the potential and semantic value of such a type of communication has to be explored and experimented further. (Minuto, Vyas, Poelman and Nijholt, 2012)

CONCLUSIONS

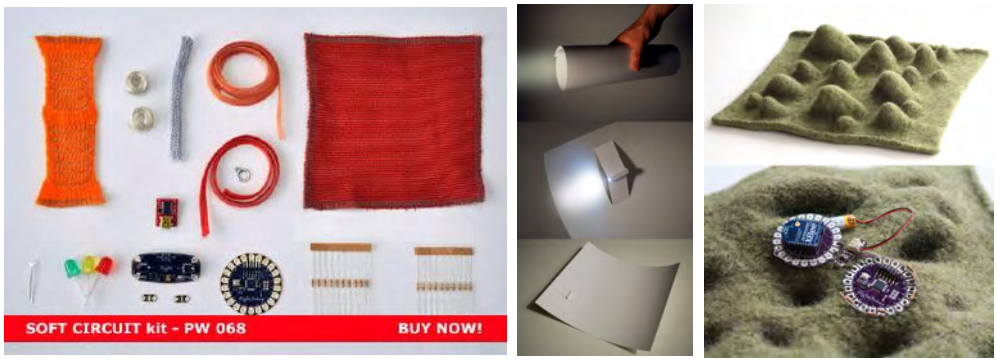
Toward a softer and friendly technology

Getting closer to the conclusion, it seams necessary to take a step back and try to understand why the theoretical and experimental discourse about interaction design has moved toward a re-materialization of user-interface supports. Indeed, the on-going experimentations about SMIs and HMI are trying to simplify HCI till the very essentiality of people's needs and feelings about their everyday life. Technological complexity is going to be softened by home-made tutorials on how to realize smart materials[5], how to make a sensor (Karvinen,

[4] A smart material has at least one or more properties that can be dynamically altered in certain conditions that can be controlled from outside (external stimuli). Each individual type of smart material has specific properties, which can be altered, such as shape, volume, color and conductivity. These properties can influence the types of applications the smart material can be used for. The most common smart materials can be in the form of polymers, ceramics, memory metals or hydro gels. Importantly, these fields can offer specific kind of smart material that can be operated using specific external stimuli. For example, polymers can be activated through light, magnetism, thermally or electrically.

[5] An interesting example is the website Materiability (http://materiability.com/) forms a continuously growing database on a wide range of materials, provides hands-on tutorials to self-produce these materials, and promotes their assembly in

Valtokari, 2014), also thanks to the commercial diffusion of conductive inks and Arduino[6] controllers (Fig.7-8-9).



Figures 7-8-9. From the left: *Soft Circuit kit* by Plug&Wear Italian company (2015); *Paper LED torch light* by Kazuhiro Yamanaka (2013) made exclusively using a cut-out piece of paper and a battery operated LED; *Felted Musical Landscape* (2012) by Andrea Miller is a textural interactive felted 3D textile project. The tips of individual bumps are capacitive touch sensors that responds to touch and plays piano notes via Processing.

The result is an opening world of design hybridizations between HCIs, materials (traditional, organic, smart, etc.), human perception studies, ecology and environment control, participatory and social design practices (Fig.10-11-12-13). All oriented to a design *thinkering* (Antonelli, 2011) process of open access resources collected against the rigid disciplines partitioning.

Figures 10-11-12-13. From the left: *Liquid MIDI* (2015) by EJtech enables the user to experience a balanced interaction and engagement through an experimental textile interface, concluding with the real time creation of sound; the *Sargasso Cloud* is an interactive sculpture by Philippe Rahm (2010), related to human interrelations with physical design, technology, resources and the surrounding climate; *MalleablePillow* (2015) is one of the design projects presented in his doctoral dissertation by Henrik Svarrer Larsen designed to engage luminous, tactile and sound interaction for pedagogical purpose; the *Conductive Bodypaint* (2009) was developed by Becky Pilditch, Matt Johnson, Isabel Lizardi and Bibi Nelson, from the Industrial Design Engineering department at the Royal Collage of Art.

We can may conclude that the real challenge of designers and architects today will be to shift from a "multimedia" approach to a "multimodal" one. Try to stop an archetypical action and be able to supervise the future of the project. Rapid and participatory development and change is preferable to individual design. The

speculative experimental projects. This trinity, information, instructions, and inspiration is ought to help develop a common language in order to communicate cross-disciplinary and bridge the gap between research, education, and practice.

[6] Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures microcontroller-based kits for building digital devices and interactive objects that can sense and control the physical world.

individual social understanding offered by a single designer cannot be compared to the collective weight of social understanding that many users provide and increasingly willingly offer. Identifying the key features of an artefact and designing solely for those features present the danger of designing for desire rather than for greater social need or purpose. Lastly we can leave an open question about the necessity of starting new researches specifically oriented on the study of sensorial human perception and kinetic elements and the influences on behavioural disturbances, due to design meaningful digital experiences in the future.

REFERENCES

Anceschi, G. (1993). *Il progetto delle interface*. Milano: Domus Academy.

Antonelli, P. (2011). States of Design 03: Thinkering. *Domus, 948*.

Bachelard, G. (1969). *The Poetics of Space*. Boston: Beacon Press.

Berleant, A. (1992). The Aesthetics of Environment. Philadelphia, PA: Temple University Press,.

Battarbee K. (2007). Co-experience: Product experience as social interaction. In H.N.J. Schifferstein & P. Hekkert (Eds.), *Product experience*, (pp. 461-476). Amsterdam: Elsevier.

Buechley, L., Coelho, M. (February 2011). Special issue on material computing. *Personal Ubiquitous Comput 15*, 113-114.

Conrad, E. W. (2005). *Tactile Space*. Master of Science in Information and Computer Science with concentration in Arts, Computation and Engineering, University Of California Irvine.

Coelho, M. et al. (2009). Programming Reality: From Transitive Materials to Organic User Interfaces. *Proceedings of the 27th International Conference Extended Abstracts on Human factors in computing systems*, (pp. 4759-4762). Boston, MA, USA: ACM.

Dourish, P. (2001). *Where the Action Is: The Foundations of Embodied Interaction*. Cambridge, MA: MIT Press.

Edelkoort, I. (2012). Super technology is going to ask for super tactility. Retrieved from http://www.dezeen.com/2012/12/28/super-technology-is-going-to-ask-for-super-tactility-li-edelkoort-at-dezeen-live/.

Hallnäs, L. & Redström, J. (2006). *Interaction Design: Foundations, Experiments*. The Interactive Institute, The Swedish School of Textiles, University College of Borås.

Hansen, M. B. N. (2011). Ubiquitous Sensation or the Autonomy of the Peripheral: Towards an Atmospheric, Impersonal, and Microtemporal Media. In U. Ekman (Ed.), *Throughout: Art and Culture Emerging With Ubiquitous Computing*. Cambridge, MA: MIT Press.

Ishii, H., & Ullmer, B. (1997). Tangible Bits: Towards Seamless Interfaces between People, Bits, and Atoms. *Proceedings of CHI'97, Conference on Human Factors in Computing Systems*, (pp. 234-241). Atlanta, Georgia.

Ishii, H. & Ullmer, B. (2001). Emerging Frameworks for Tangible User Interfaces. In J. M. Carroll (Ed.), *Human-Computer Interaction in the New Millennium*, (pp. 579-601). Addison-Wesley.

Ishii, H., Biederman, A., Ratti, A. (October 2004). Continuous Tangible Interfaces: Bringing Clay and Sand into Digital Design. *BT Technology Journal, 22, 4*, 286-299.

Ishii, H., Lakatos, D., Bonanni, L., Labrune, J-B. (January 2012). Radical Atoms: Beyond Tangible Bits, Toward Transformable Materials interactions. *Interactions 19*, *1*, 38-51.

Karvinen, K., Karvinen, T., Valtokari, V. (2014). *Make: Sensors: A Hands-On Primer for Monitoring the Real World with Arduino and Raspberry Pi*. Maker Media.

Kolko, J. (2011). *Thoughts on Interaction Design*. Morgan Kaufmann.

Larsen, H. S. (2015). *Tangible Participation: Engaging designs & designerly engagements in pedagogical praxes*. Doctoral dissertation, Certec, Department Of Design Sciences, Lth, Lund University.

Lowgren, J. (2014). Interaction Design - brief intro. In M. Soegaard, & D. Rikke Friis (Eds.), *The Encyclopedia of Human-Computer Interaction* (2nd Ed). Aarhus, Denmark: The Interaction Design Foundation. Retrieved from https://www.interaction-design.org/encyclopedia/interaction_design.html

Loren, L. & Dietrich, E. (1997). Merleau-Ponty, Embodied Cognition and the Problem of Intentionality. *Cybernetics and Systems 28*, 345-358.

McCullough, M. (2005). *Digital Ground: Architecture, Pervasive Computing, And Environmental Knowing*. Cambridge, MA: MIT Press.

Merleau-Ponty, M. (1962). *The Phenomenology of Perception*. London: Routledge.

Minuto, A., Vyas, D., Poelman, W., Nijholt, A. (2012). Smart Material Interfaces: A Vision. In A. Camurri, & C. Costa (Eds.), *Intelligent Technologies for Interactive Entertainment* (pp. 57-62). Springer Berlin Heidelberg.

Moggridge, B. (2006). *Designing Interactions*. Cambridge, Massachussetts: MIT Press.

Robles, E. & Wiberg, M. (2010). Texturing the "material turn" in interaction design. *Proceedings of TEI '10 the fourth international conference on Tangible, embedded, and embodied interaction*, (pp.137-144). New York, NY, USA: ACM.

Saussure, F. (1974). *Course in General Linguistics*. London: Fontana/Collins.

Smith, G. (2007). What is interaction design. *Designing interactions, 8*-19.

Vallgårda, A., Redström, J. (2007). Computational composites. *Proceedings of CHI'07*, (pp.513-522). New York, NY, USA: ACM.

Varela, F. & Thompson, E. J. (1992). *The Embodied Mind*. Cambridge, MA: MIT Press.

Vink et al. (April 18-23, 2015). TRANSFORM as Adaptive and Dynamic Furniture. *Proceedings of CHI'15*. Seoul, Republic of Korea.

Weiser, M. (1991). The computer for the 21st century. *Scientific American 265*, 3, 94 - 101.