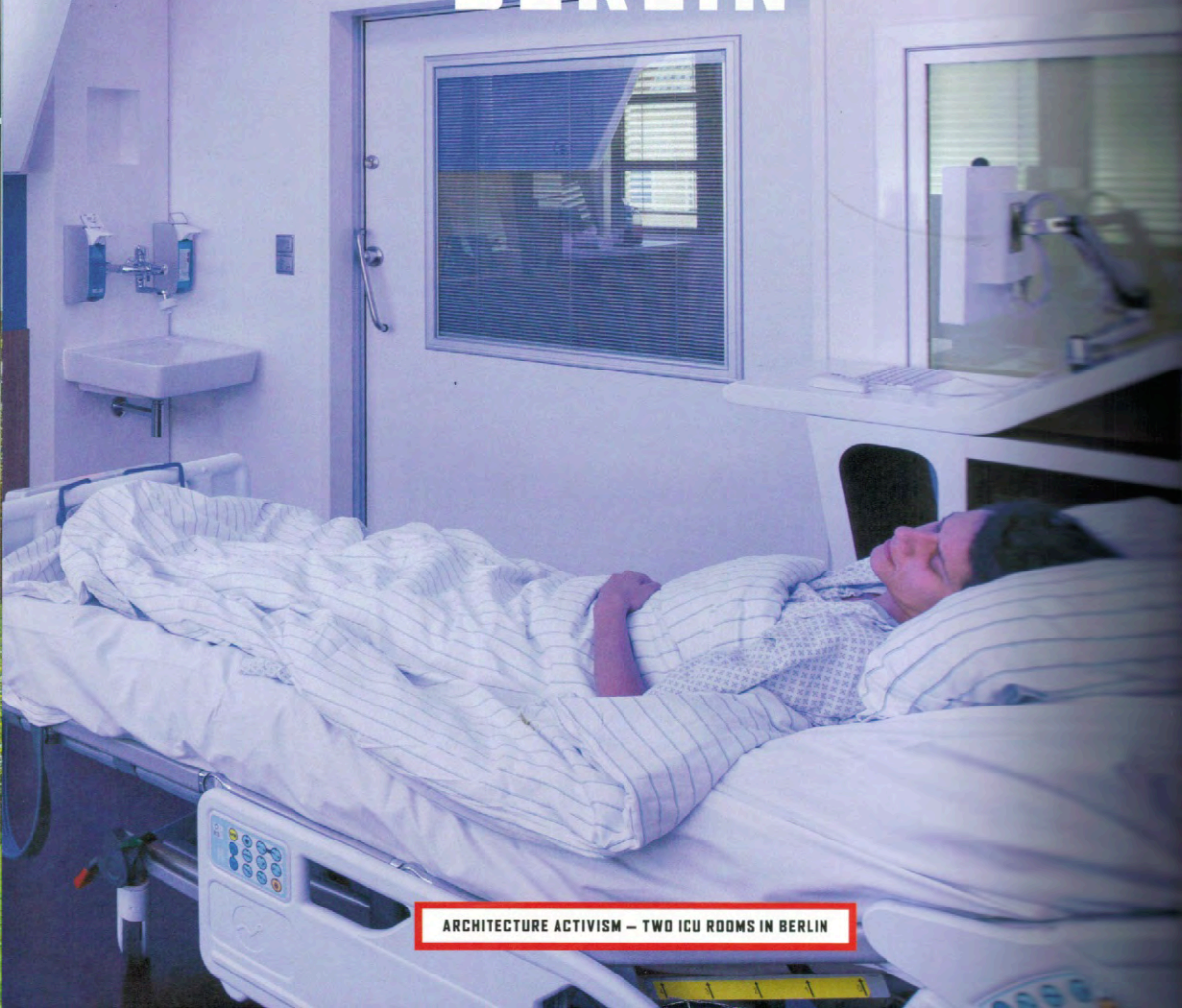


# LINKING DESIGN AND HEALTHCARE IN A RESEARCH PROJECT FOR TWO ICU ROOMS IN BERLIN



ARCHITECTURE ACTIVISM – TWO ICU ROOMS IN BERLIN

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**DESIGN**

**FOR**

**EVID**

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# MAN-MADE NATURE

It is not surprising that while we understand the fundamental interdependency of economic growth and its side effects, i.e. socio-economic development on the one side and climate change on the other, we are increasingly questioning how healthy and sustainable our strategies for the built environment in general really are. Concepts for energy consumption, renewable ways to generate energy, electro mobility, Cradle-to-Cradle product design concepts or organic food production, to just name a few, are symptoms of the same search for a healthier lifestyle, extended youth and a longer life.

At the same time healthcare is one of the fastest-growing and most innovative business sectors, and a major employer in many industrialized nations. The demographic trend towards an aging population in industrialized countries is expected to intensify this development even further. But research and development in healthcare today focuses on much more than technically well-equipped and perfectly organized hospitals with highly educated doctors and staff. Aside from the quality of a cure and treatment, we are also becoming increasingly aware of the importance of health precautions and of preventative medicine and healthcare. We regard the idea of the salutogenesis of health as a process, as a result of our way of life and our daily routines, even as being the key to our psyche. This includes detecting stress factors that affect the healing process, such as noise, lack of light, insufficient privacy as well as a lack of human interaction. But what is a healthy space, how can we as architects address and understand these aspects and factor them into the complex procedures of architectural planning. How can we support the outcome of social spaces that support interrelationships between people?

It seems we need a more differentiated understanding of the preconditions for adequate architectural planning and a new holistic approach based on more than theoretical assertions.

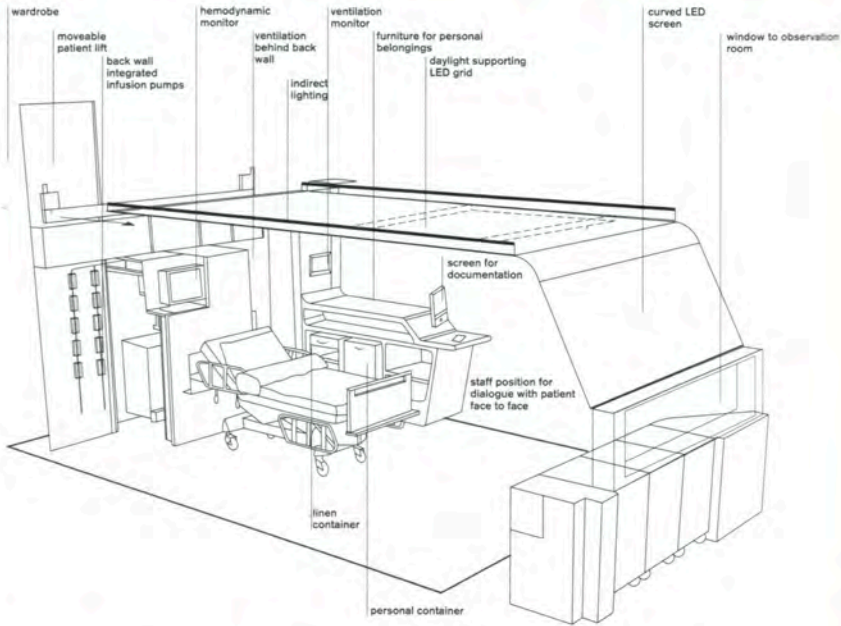
## UNTRODDEN PATH

When GRAFT was approached by the renowned, innovative dentist Dr. Stefan Ziegler from Berlin in 2004, the architects were introduced to radical new ideas for treatment processes that signaled a shift in what patient-centered services and medical practices could look like in the future. Dr. Ziegler's idea of a dental practice that looked more like a hotel or an apartment – an uplifting everyday environment – than a clinic, marked for GRAFT the starting point of a whole series of designs for medical practices, and has fundamentally influenced how the architects approach the design of medical practices and clinics today. The success of this clinic, and later of those of Dr. Mokabberi and others all over the world, along with feedback from patients, demonstrated that the potential for architectural quality and ambitious design in healthcare had been widely underestimated. And these projects were only the beginning.

GRAFT learned from Prof. Claudia Spieß at the Charité Hospital in Berlin that holistic design could open up a completely different dimension. In her research on the causes and condition of “delirium”, Prof. Spieß identified the relevance of stress factors such as noise, distractions, the lack of view, of light, and of privacy, as important factors that influence the healing process and patient outcome. A lack of daylight and insufficient lighting conditions generally trigger fatigue and dizziness during the day, which causes sleep disorders at night.



View from the observation room into the patient's „living room“

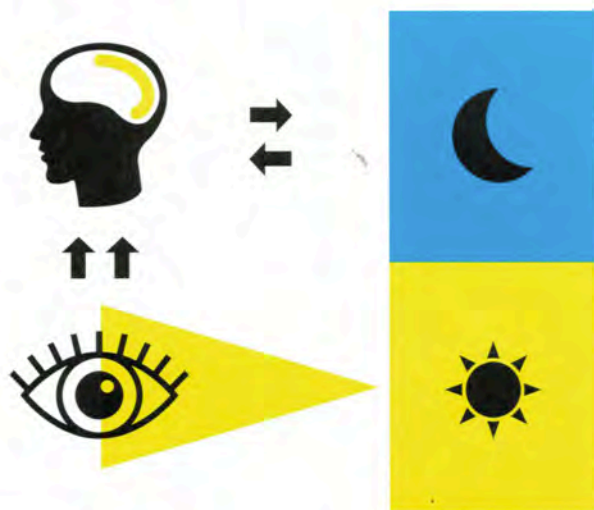


Axonometry of the single bed setup based on the perception parameters of the patient

## CIRCADIAN RHYTHM, SLEEP AND COGNITION

Especially the feeling of having to completely surrender to circumstances, the general climate of tension and lack of privacy affect the patient's well-being and, so the research, the process of healing. These are common phenomena in Intensive Care Units (ICUs), and are even considered to be co-responsible for far more dramatic conditions such as "postoperative delirium", which can cause serious long-term cognitive impairment, resulting in high remission rates and the need for intensified nursing care. It is increasingly clear that the setting as a whole induces stress and consequently has a negative impact on the healing process. All these aspects are of obvious relevance for any architectural planning.

However, medical environments are still considered as autonomous and rather functional and technical spaces, far removed from everyday life and routines. In particular, the extreme circumstances and sense of maximum physical vulnerability in ICU rooms is an experience largely disregarded in architectural design discourse. Although Prof. Claudia Spieß and others point to the negative side effects of sterile, purely functional and impersonal spaces in intensive care units, empirical data is lacking to back up their intuition and findings. As such, the quality of architectural design in hospital contexts and its profound influence on human health has not been accorded the attention it deserves. For GRAFT, the time had come to reconsider the design of these interior environments, which sooner or later every one of us may have to experience!



## TERRA INCOGNITA

What defines healing architecture? Together with Prof. Spieß, GRAFT began exploring the design of a new generation of ICUs, and built a prototype in order to understand the interrelationship between space and the healing process. In close collaboration with Prof. Spieß and her staff at the Charité Hospital in Berlin, the architects embarked on one of the greatest design challenges the office has taken on in recent years: how can we design a space to be indisputably healthier than other such spaces?

The first decision was to design from the perspective of a patient. All initial renderings showed what can be seen in the cone of vision of a patient lying in bed. GRAFT showed that, more than in any other space, the ceiling above the bed was the most visible surface, and designed a media screen that bends in order to cover as much of the field of vision of the patient as possible. The space on either side of the bed was freed up and all technical equipment moved into a wooden back wall behind the head of the patient. Additional furniture was developed to provide privacy. A further significant decision was to remove alarm signals and screens with vital data away from the patient into a so-called observation room that each patient can see through a window.

The intention was that by improving the physical environment and comparing it with a conventional ICU, doctors would be able to observe and analyze the interrelationship between architecture and the general healing process of patients. More specifically, the idea was to fundamentally reconsider the ICU environment to conduct empirical studies on the relationship between physical environments and evidence of "delirium" – a first attempt to empirically detect these phenomena in their relationship to architecture and the effect on the physical outcome of a patient.

IN THE FIVE-YEAR "PARAMETRIC DREAM ROOM" RESEARCH PROGRAM, GRAFT REVEALS THE



ARCHITECTURE ACTIVISM – TWO ICU ROOMS IN BERLIN



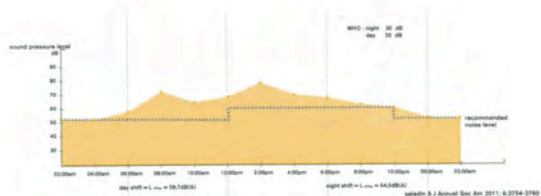


From the beginning, it was clear that GRAFT would have to speak to and involve all kinds of specialists, from sleep researchers to experts in lighting and acoustics. In addition, they had to analyze and understand the procedures and technical necessities in order to resolve the technical problem of hiding equipment and relocating life-saving technology. The architects also had to find or devise appropriate content for the media screen that could be shown to critically ill patients. A project of this complexity could not have been done without appropriate research funding and support from a government program. Prof. Spieß, GRAFT and friends from the media design agency Art+Com therefore applied for research funding for a two-year program, which was accepted in October 2012, resulting in the start of the "Parametrische (T)Raumgestaltung" (parametric dream/space design) project funded by the German Federal Ministry of Economic Affairs.

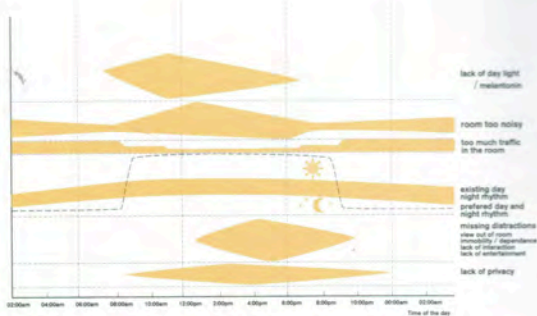
## DESIGNING HEALTH

The group of initiating doctors from the Charité, media artists and IT specialists from Art+Com as well as the initiators and architects from GRAFT teamed up with several university departments for lighting research, sleep research and acoustics as well as psychologists from the Charité in order to undertake fundamental research into the empirical reduction of recovery time in ICU rooms through architectural measures. To begin with, it was necessary to collaborate in determining all the stress-inducing "soft factors" in order to acquire a differentiated and in-depth understanding of typical factors that can be addressed through design, for example insufficient lighting conditions, noise and so on. Daylight-supporting measures that reinforce circadian rhythms during the day, indirect warm light in the evening, and individually controllable illuminating content provide doctors and patients with a broad spectrum of possibilities, with the aim of creating a comfort-reinforcing perception of space and time. These interventions are reported to improve melatonin suppression, helping patients to stay awake and focused during the day and sleep soundly at night. All light measures are pooled in the central screen that replaces a conventional ceiling. This large-format LED screen (2.4m wide and up to 7m long) is mounted in the field of view of the patient. The screen gives primary focus to the ceiling above the patient, a surface that is otherwise accorded little importance. Architecture and media content are grafted into one smart surface.

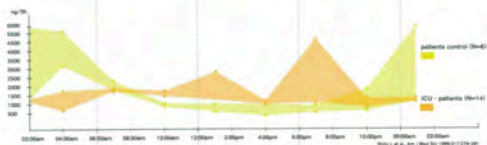
Through their research, GRAFT discovered that some patients leaving hospital had even counted all the holes in the acoustic ceiling! The huge screen would therefore also be for entertainment and distraction. The screen above the patient can display soothing and slowly changing images, such as blue skies, moving clouds or green leaves, and also acts as an interactive tool to help patients do cognitive and physical exercises. The concept and design of the media screens is by GRAFT and was developed in cooperation with and generously co-sponsored by the Dutch Media Company PHILIPS. Art+Com contributed the content development and IT support, and devised the user interface for the screen and the doctors' devices.



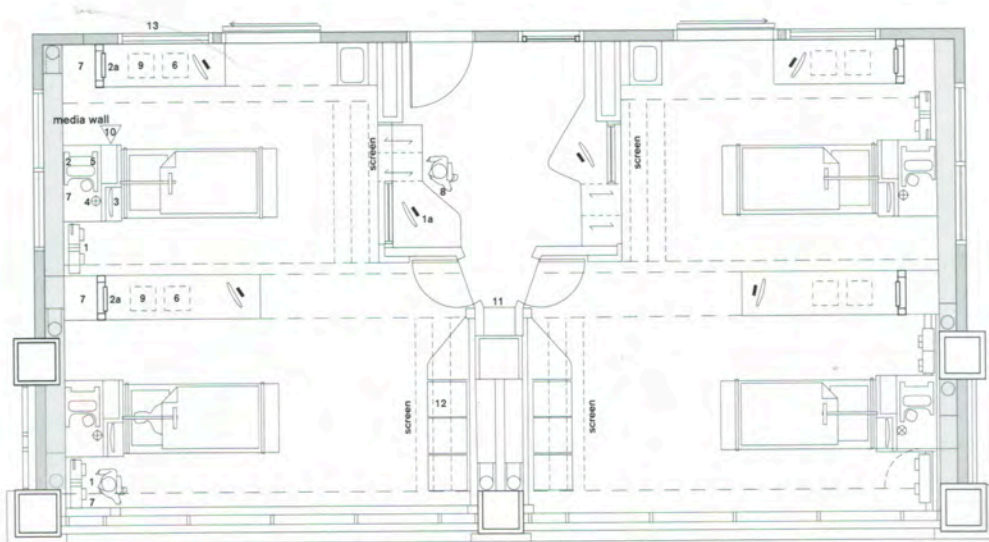
Noise level in an ICU



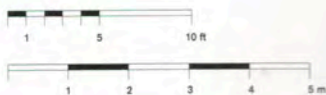
Summary of relevant parameters for the design process



Disturbed melatonin secretion of ICU patients



- 1 infusion pumps
- 1a infusion pumps alarm
- 2 long term ventilator
- 3 hemodynamic monitor
- 4 exhaustion
- 5 additional medical gas bottles
- 6 laundry
- 7 others / small appliances
- 8 nurse seating
- 9 bedside lockers
- 10 medical connections
- 11 glass trash
- 12 moveable medicals & material storage
- 13 opaque / transparent switchable glass-window



Floor plan of the prototypical ICU with four beds and observation room in the center

During the design phase, the patient's well-being and perception always remained a main priority. Alarm signals and noises caused by equipment were removed by shifting medical devices to a centrally-located observation room to improve the acoustic situation. Furthermore, GRAFT improved the air-conditioning outlets, shielded the sound of technical equipment, and found ways to move restocking procedures out of the room.

In order to enhance the subjective feeling of "being in charge", a patient lift affords a degree of physical mobility and exercise. Furniture is individually usable and screens provide a crucial measure of privacy in the rooms. All technical equipment and supply lines are hidden in a wooden "service wall" behind the hospital bed, disappearing completely from the patient's field of view while still perfectly accommodating the workflows of the medical staff.

The interior concept addresses the typical expectations and prejudices about intensive care units and creates an inviting and welcoming atmosphere. The project draws on lessons from a number of empirical parameters to transform a functional and purely technical environment into a comforting space that can benefit the speed of recovery and outcome of medical treatments. The use of large surfaces, a dark wood floor, as well as soft and flowing forms creates a homely rather than a clinical atmosphere.

The ICU rooms were constructed under the joint supervision of GRAFT and the architectural staff of the Charité Hospital and two pioneering ICU rooms were opened in late 2013. Currently, a team of scientists and doctors is monitoring the outcome and long-term effects of the rooms as part of a three-year research program. Final research data will be available in early 2017.

## **IN PURSUIT OF HEALTH**

Through this project, GRAFT has revealed the huge potential for collaboration between designers and the healthcare industry. The parametric dream room for the Charité Hospital in Berlin is not simply about designing a better hospital, but about a shift in paradigms: from the abstract terminology of sustainability towards an intelligent design of healthy human environments based on empirical data. The research project as a laboratory for understanding the perception and consequences of architectural aspects on our health is patent pending. Apart from its specific intention, the project is also an attempt to establish links between provable, quantifiable and measurable aspects of architecture and non-quantifiable implications such as beauty and aesthetics.

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on the basis of a decision  
by the German Bundestag



**TYPOLGY:** Scientific research project and prototypical ICU (Intensive Care Unit) rooms

**LOCATION:** Berlin, Germany

**SIZE:** 74m<sup>2</sup>

**TIME:** 2011–2013, research ongoing

**STATUS:** built, research ongoing

**CLIENT:** Charité CFM (Charité Facility Management), Partner in the research project

**PARAMETRISCHE (T)RAUMGESTALTUNG:** Charité, Prof. Claudia Spieß, Alawi Lütz, CFM Charité Facility Management, Art+COM, Joachim Sauter, Joachim Quantz

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