Sound work and visionary prosthetics: artistic experiments in Raoul Hausmann

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Abstract

The oeuvre of Raoul Hausmann, Berlin's 'Dadasoph,' provides a rich case of an artistic experimentalism revolving around prosthetic devices. Highly critical of the contemporary technosciences and their way of fixing maimed bodies by means of prosthesis, Hausmann did not disregard prosthetic technologies in general, quite the contrary, he had larger aims with them in mind. He envisioned the fusion of art and technology as a decisive step in the shaping of 'new man,' the human of the future, liberated from the constraints of nature and tradition. Several of his innovative art forms like the photomontage or his typographic arrangements focus on this double aim of breaking away from tradition and transgressing the biological boundaries of the body. Hausmann's vision of re-engineered human bodies perceiving 'nature' in hitherto unknown ways may have lost much of its appeal, but his art opened up new ways of exploring technoscientific epistemologies.

We demand the extension and conquest of every sensory capacity.

Raoul Hausmann[1]

At a recent conference on the achievements and breakthroughs in the design of retinal implants, the principal investigator of one of the leading teams competing for the first successful implantation of a microchip into a degenerated human eye proudly reported on the concepts of his group, the promising results of their pilot studies and the preparations for a clinical trial.[2] In the discussion that followed, a colleague asked whether the group also planned to implant devices extending the visible spectrum into infrared or ultraviolet light. The question may seem farfetched, but in fact, common photosensitive elements differ from the human eye in the wavelength at which they activate, and infrared sensors are common tools. However, all of a sudden the atmosphere at the conference changed. The scientist tried to contain his surprise and irritation by underlining how natural the entire project was, involving nothing but a technological replacement for a natural process, a device limited to the very specifications of the physiological. The question had obviously touched upon a literally 'sensitive' issue. Apparently it becomes important to insist all the more on the alleged naturalness of a scientific project and to maintain established borders, when technoscience goes science fiction.

Today and with the sciences' truly fantastic potential it may have become more evident that the sciences conjure up artificial worlds and invoke science fiction; according to the French

epistemologist Gaston Bachelard, however, this is nothing categorically new but the direct consequence of the sciences' move from observation to experimentation:

> Once the step is taken from observation to experimentation, the polemical character of knowledge stands out even more sharply. New phenomena must be selected, filtered, purified, shaped by instruments [...]. A truly scientific phenomenology is therefore essentially a phenomeno-technology. Its purpose is to amplify what is revealed beyond appearance. It takes its instruction from construction. Wonderworking reason designs its own miracles. Science conjures up a world, […] modern science has moved on to the project of constructing a world in the image of reason.[3]

According to Bachelard, the modern sciences are ways of projecting and shaping the world, and in this respect they are as constructive as the arts. Bachelard conceptualised of the sciences as constructive 'phenomeno-technologies' on the basis of his thorough analysis of the epistemological revolution in theoretical physics at the beginning of the twentieth century. When he published *The New Scientific Spirit* in 1934, it brought him in contact with another group interested in transgressing the taken-for-granted boundaries of reason and reality. Invited to contribute to the inaugural issue of the surrealists' review *Inquisitions*, Bachelard welcomed surrealism in a short piece exploring some epistemological links between the sciences and the arts.[4] Entitled 'Le surrationalisme' and printed as the journal's opening article, it drew an analogy between how the surrealists employed poetic freedom in order to acquire perceptual fluidity and how experimental rationality organized reality.[5] In the twentieth century, it has become a truism to state that experimentation unites art and science, but it still is not obvious what exactly these practices share and where they differ. According to Bachelard a constructive dynamism bridges the two. The surrealists mobilised perception to get beyond visible appearances in somewhat similar ways as the sciences reconstructed reality in accordance with scientific reason.

Bachelard's notion of 'surrationalism' was more than a playful tribute to an avant-garde of his time, as his further elaborations on this term in his *La philosophie du non* testify. The translator of this book, however, felt nonetheless obliged to make an apologetic comment before introducing the famous neologism into English. 'The translator has his choice: super-rationalism, supra-rationalism, even, perhaps, meta-rationalism. But, since it seems to be Bachelard's intention to link *surrationalisme* with literary and artistic *surréalisme*, it seems appropriate to make an English neologism, "surrationalism".'[6] Some fifty years later and following the application of, for example, particle physics to the construction of atomic bombs, synthetic chemistry to the production of ozone holes, neurosciences and nanotechnology to the development of the retinal implant, it is probably less the constructivist undertone of Bachelard's surrationalism that provokes criticism than its intrinsic optimism. It can hardly be questioned that the modern

technosciences construct reality as much as they determine it. If anything, one could wonder where the surrealists' creative freedom has gone and whether one may still find an analogue of it in contemporary scientific activity.

Bachelard's observation, however, that constructions from the field of the arts may serve as exemplars for epistemological reasoning and analysis, calls for further reflection. First of all, it offers a much more intriguing insight into the parallels between the arts and the sciences than their usual pairing as humankind's most creative enterprises. The crucial aspect of both art and science is less their creativity per se than their potential for changing reality, their experimentalism. On this shared basis, however, it seems that experimentation in both realms followed and follows different principles. Where the scientist quoted at the beginning of this article stressed the 'naturalness' of the prosthetic device soon to be tested in a first series of clinical trials, contemporary performance artists such as Stelarc, for example, explore the 'posthuman' by emphasising the very artificiality of the hybridisation of human beings with machines.[7] In a certain respect, it seems, artists develop not only the more critical but also the more radical projects in the field of visual prosthesis. It thus becomes not only a promising enrichment but also almost a prerequisite to investigate visual culture and experiments in contemporary art in order to arrive at a sufficiently rich understanding of experimentation in modernity.

This is certainly a task far beyond the scope of this paper. Instead, I offer a preliminary case study of an early example of artistic experimentation in the field of visual prosthesis. Raoul Hausmann, contemporary of Bachelard and Berlin's most prominent Dada artist, offers a particularly rich case for investigating the ambiguities of prosthetic vision. I will examine some of his artworks as a form of experimentation in between artistic and scientific exploration. I am not interested in portraying him as a 'scientific' artist, nor as an 'artful' or 'artistic' scientist, though such readings may be plausible and even productive. Instead, I want to use Bachelard's argument about the epistemological similarities between these two practices to introduce Hausmann's works as a case study on experimentalism in the visual arts, more specifically in artistic perception and sensory prosthesis. After all, in his short essay on surrationalism, Bachelard localized the *tertium comparationis* in the appropriation of sensory perception by artistic and scientific experimentation and saw in the 'fluidity' of perception as effectuated by the surrealists one of their biggest accomplishments. Hausmann engaged in both, exploring sensory perception by means of innovative art forms, and constructing prosthetic devices that transformed sound and light into each other. His work does probably not offer any straightforward advice for dealing with the irritation that so suddenly erupted at the conference mentioned at the beginning of this article. But his art operates in a space which transgressed 80 years ago the ontology the scientist concerned so desperately wanted to see remain in place today, even though (or because) his experiments were constantly undermining this very ontology of stable natural objects.

My analysis of Hausmann and Berlin Dada also follows another line of inquiry. I aim at developing notions of experimentation that cut across disciplinary boundaries for the purpose of integrating the history of science into a larger cultural history of knowledge. In the context of a project on how electricity became a medium of psychic life during the first half of the twentieth century, I studied the specific spaces of experimentation, since a substantial number of the activities and debates crucial for the emergence of a field of 'electro-psycho-physiology' did not take place in scientific laboratories or journals.[8] Radio stations engaged in large-scale trials on electrical telepathy, for example, and the new cultural practice of listening to the radio required a fair amount of skillful experimentation at home. The public did not only listen to the news about scientific experiments; the very process of society's technological modernisation itself presented new scientific questions. Building on earlier work on the 'experimentalisation of life' by laboratory physiology during the nineteenth century, these science-in-culture dynamics could be described as an experimentalisation of *everyday life*, in terms designed to capture and heighten this particular aspect of the scientific culture during the early twentieth century by which potentially every aspect of human life and social activity could be subjected to scientific exploration and mobilisation.[9]

The experimentalisation of everyday life would have to account for both the rationalisation of the life-world in Weberian terms and its re-enchantment by the very means of modernity; a process of heightened scientific control but also of increased complexity as a result of the dissolution of traditions and customs. A remark by Walter Benjamin on the new life in revolutionary Moscow connects these more general remarks to my topic here since it captures, in my understanding, quite precisely the essential elements of the spirit of Berlin Dada, pertinent with regard to the larger project of a cultural history of experimentation: 'Each thought, each day, each life lies here as on a laboratory table.'[10] Benjamin's observation of a culture of radical experimentalisation shall serve here as the guiding perspective for examining Raoul Hausmann's Dadaist activities. Berlin Dada occurred at a moment in German history that certainly differed in many respects from life in Moscow during these years. Nevertheless, by German standards, these were truly tumultuous and revolutionary years. Experimentation took place on almost every level and in every corner of society. The Dadaists' slogan of 'being anti-everything' captures something of that spirit: '[The Dadaists] followed the play-instinct wherever it led them and paid no heed to God or man, art or society, but only to their own unrest, THEMSELVES, the need for change. … Dada in its pure state was pure revolt, ANTI-EVERYTHING!'[11] Again, I am not interested in ascribing to Hausmann or the Dadaists the conscious intention to experiment in radical ways. Benjamin's notion of everyday experimentation, which I employ here precisely to move away from this form of personalised history, points to the significance of the larger cultural context. The Dada movement took place right in the heart of society; the Dadaists engaged with the public. In Berlin, one could argue, Dada subjected the public to experiments; it was an

experimentalism in public and with the public. By investigating some of their artistic practices, I hope to develop further the notion of the experimentalisation of everyday life.

To foreground Hausmann in such a way and to take individual works of art as examples of a particular line of exploration runs the risk of false generalisations, however, as becomes apparent by looking at Hausmann's technological reconfigurations of the human body. Hausmann's work presents a case where everything fits together seamlessly, as it were: a political critique of society, a critical aesthetic arguing for new and experimental forms of art (and exemplars of this such as photomontage or the optophonetic poem), a speculative psychophysiological theory of 'new man,' and even some experimental construction work with technological devices. It seems as if all that is needed is simply to pick out from his oeuvre the relevant pieces and assemble them to fit the image of an experimental mobilisation of human perception beyond its assumed principles. The main pitfall of such an approach is, obviously, to take Hausmann's works of art simply as a materialisation of scientific theory, as if his work 'illustrated' a style of scientific experimentation through the medium of art. Instead, it is exactly the interplay of material practices and conceptualisations that should be the locus of investigation and scrutiny, since Dada was, in Hausmann's words, a realm 'for the appearance of conflicts.'[12] Rather than presenting Hausmann as the test case for 'scientific' art, the material complications of the coming together of theory and objects should be questioned with regard to their inherent tensions, differences, or conflicts. The heterogeneity of Hausmann's oeuvre, refusing any single overview or simple demarcations, is just a case in point.

Instead of bridging art and science by asking whether Hausmann's work can justifiably be described as a particular style of scientific experimentation, I will focus on the material practices linking these domains as exemplified in some of his works. In doing so, I will follow the lead of material culture studies in the history of science.[13] When such studies have consistently demonstrated the artificiality and 'surrealism' of scientific objects, it seems almost 'natural,' so to speak, to investigate how other artificial objects, and especially works of art, operate in the contested field between nature and culture.[14] Here one deals, I would argue, with a highly fascinating zone of overlap between art and science which deserves further investigation. Works of art share a range of characteristics with scientific objects but, at the same time, they are situated in a different epistemological space. In fairly general and preliminary terms, works of art may be characterised as neither natural nor fictitious but as artificial and material at the same time.[15] They are material objects, but not necessarily shaped in accordance with scientific concepts of nature. Hence, they may be positioned as artificial objects that question certain notions of nature and naturalness. Hausmann's works, moving between political criticism, experimental art and prosthetic engineering, offer intriguing insights into the ambiguities of artificial natures, as I want to show. It is not of concern to me, however, whether Hausmann conceptualised the articulation of art and science in terms similar to my analysis, just as,

conversely, I am not in a position to offer here a comprehensive analysis of Hausmann's work. The aim of this article is to introduce and use – if not abuse – a few of his art works as the basis for some comments on the notion of prosthesis and for an exploration into human perception. Some of Hausmann's works demonstrate, I will argue, a transgression of established ontologies that also ultimately undermines his own psychophysiological theory. I will begin with Hausmann's employment of prosthesis as a rhetorical trope that also brings in the new art form of photomontage. Then, I turn to Hausmann's experiments in typography and to his optophonetic poetry, before I finally conclude by briefly discussing Hausmann's optophone, a device that reintroduces the concept of prosthesis, although from a different perspective.

Figure 1: View of the First International Dada Fair at the Berlin gallery of Otto Burchard, 1920, black and white photograph, 11.9 x 16.5 cm. Berlinische Galerie, Berlin. Dix's *Kriegskrüppel* is on the left wall.

Prosthesis and photomontage

To talk about prosthesis in the Berlin of the early 1920s meant to talk about the war, about the mass production of disabled bodies. This was all the more true for the Dadaists. Among the many works of art on display at the famous First International Dada Fair, which opened on 30 June

1920 in the rooms of Otto Burchard's art gallery in Berlin, was, for example, Otto Dix's *Kriegskrüppel* (1920), depicting a parade of ex-soldiers, still marching on, regardless of their disfigured and – by means of prosthesis – only partially reconstituted bodies [Fig. 1]. The First World War had ended with Germany's defeat and had resulted in large numbers of maimed soldiers. It was followed by a period of anarchy and revolution, including skirmishes between striking workers, troops loyal to the Kaiser, and the forces of the new republic in the streets of Berlin in 1919. Hans Richter later recalled the atmosphere of Berlin Dada:

> Dada in Berlin had a very different tone from Dada in Zurich and New York. The Berlin Dadaist might well look down on their Zurich colleagues, who had admittedly insulted the citizenry, but had no real collapse … no revolution to their credit. In Berlin they had a real revolution and they decided to join in. There was the sound of firing in the streets and on the rooftops. Not only art but all thought and all feeling, all of politics and society, had to be drawn into Dada's sphere on influence […] While in one corner of Berlin, sailors were defending the imperial stables against troops loyal to the Kaiser, the Dadaists were laying their plans in another corner. When the stables fell, there was fighting at the Anhalter Bahnhof, in the Belle Alliance Platz and in Charlottenburg. Soldiers' councils and workers' councils, meetings, fraternal unions – a new age had dawned! Dada felt called upon to put the new age in perspective – and the old one out of joint.[16]

Dix's polemical parade of prostheses was one way it seems to bring the unbearable consequences of the war and the old regime to attention. Another was, for example, the publication of a horrendous collection of photographs of wounded soldiers with brief explanatory statements written by Ernst Friedrich in the four languages of the main war parties: German, French, English, and Czech. Again, the parade of prosthetic soldiers was included here [Fig. 2].[17]

Figure 2: Examples from Friedrich's pacifist photographs of maimed soldiers, refitted with prostheses, from Ernst Friedrich, *Krieg dem Kriege*, Freie Jugend, Berlin, Germany, 1926.

At about the same time, Hausmann published a brief text, 'Economy of Prosthesis,' in *Die Aktion*, one of Weimar Germany's best-known pacifist journals.[18] In this short satire, he engaged even more drastically in what one could call cynical realism. At face value, this text is a typical example of Dada's 'sheer irascibility,' deriding the sincere efforts of medicine and science to help suffering soldiers.[19] But by making jokes about the sad details of prosthetic life the satire exposes the disturbing and distressing reality through the relief mechanism of laughter. Hausmann, the 'warhorse of Dada polemics' as Walter Mehring once labeled him, employed his cynical irony so masterfully that he undercut his own satire; ultimately his parody unveiled the intrinsic cynicism of the technological fix.[20] Hausmann's cynical irony operates according to a radically mimetic approach. By imitating the cynicism of militarism, he exposed its brutality:

Every child knows what a prosthesis is. Today, a prosthesis is required by the man from the street as hitherto his beer, the Berliner Weisse. The arm of the proletarian becomes noble as soon as a prosthesis is attached. Prosthetic man, therefore, is the better man, made aristocratic, so to speak, by merit of the Great War. … Yes, the Brandenburg artificial arm: It fits everyone and everyone wants it. There are so many things to do with such an arm. Pouring boiling water over it without scalding one's hand, for example. What natural arm withstands that? The artificial arm type Brandenburg is an engineering marvel and an act of grace. Even shots go through without hurting.[21]

The vitriolic irony of pieces such as this one hurts quite literally; sarcasm has been turned into a form of shock therapy. In its use of slang and abbreviated sentences, the German resonates with

the firing of the guns it describes; it engages in a mimetic approach to its subject. The writing performs a salvo of gunshots, bursting into the orderly structure of language, severing many of the sentences and leaving them incomplete, crippled. The almost haptic or tactile qualities of Hausmann's irony fits with Walter Benjamin's famous description of Dadaism: 'The work of art of the Dadaists became an instrument of ballistics. It hit the spectator like a bullet.'[22]
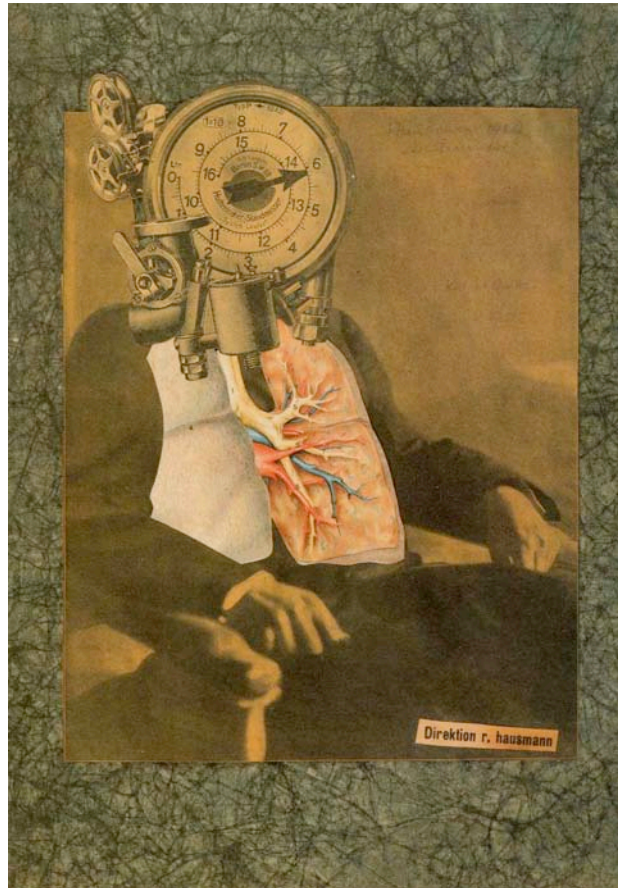

Figure 3: Raoul Hausmann, *Self-Portrait of the Dadasoph*, 1920, mixed media, 36.2 x 28cm, private collection. © Estate of Raoul Hausmann/ADAGP (Paris)/SODRAC (Montreal) 2005.

This mimetic quality prevents any prompt incorporation of Dada irony as moral and political criticism. Irony such as that seen here, revealed an engagement with the other beyond critical distance, or rather at the heart of this criticism itself. In the words of Hausmann, 'bluff is not an ethical principle but a form of self-detoxication.'[23] Bluff and irony were above all forms of auto-medication; and as a therapeutic means they required, apparently, a certain amount of identification, a partial fusion, with the object of criticism. It is important to follow this more ambiguous path in Hausmann's photomontages since it adds a new reading to one of his best-known photomontages, the *Portrait of the Dadasoph*. [Fig. 3] The story behind the concept of photomontage is well known: on the occasion of their holiday in the summer of 1918 on the Baltic

coast, where they saw in almost every house a framed colored lithograph with the image of a soldier against a background of a barracks, Hausmann coined, together with Hannah Höch, the term 'photomontage.' He was among the first to engage in this modernist genre – and strove aggressively to oppose accounts identifying a different genealogy for the technique of collage.[24] According to the common, more conventional reading, photomontage offered to portray accurately the new cultural and political situation in an intentionally 'flat' and 'modern' medium.[25] Hausmann once confirmed such a socio-historical reading of his work:

> I was among the first to use photography to create, from often totally disparate spatial and material elements, a new unity, in which was revealed a visually and conceptually *new* image of the chaos of an age of war and revolution [...] The field of photomontage has as many possibilities as there are changes in the *milieu*, its social structure, and the resulting psychological superstructure — and the *milieu* alters every day.[26]

What exactly is the economy of prosthesis in the *Portrait of the Dadasoph*? It shows a partly technological, and partly biological or surgical reconfiguration of a human body. The head has been replaced by an ensemble of technology. A combination of pressure gauge and film projector pass for face and brain, whereas the chest offers a look inside the body in the form of an anatomical preparation of the lung with its tubes and arteries. According to the socio-historical reading, this photomontage portrays a cyborg *avant la lettre* with nothing in its head but machines. This photomontage was a representation of the inhumanness of men in Weimar Germany, as Craig Adcock has argued:

> Hausmann used his photomontage technique to come to grips with an environment that had been wrecked by the machinery of destruction. … By photomontaging [sic] together men and machines, by creating sinister constructs like *Tatlin at Home*, he could portray the inhumanness of men. A cyborg with nothing in his head but machines might have become sufficiently evil to be at home in the chaos of an age of war and revolution. … Merged human and mechanical attributes afforded Hausmann the opportunity for making a negative comment about the progressive mechanization of human beings. ... Hausmann's verbal outcry was given visual expression by the creation of cyborgs.[27]

Along similar lines, Timothy Benson has argued:

> Hausmann's *Mechanical Head* presents culture as a product of mechanical processes, an array of arbitrary symbols on which the emptiness at the center [sic] of consciousness

is dependant for its very meaning. … The Dadaists viewed themselves as constructors and engineers and exploited the machine metaphor to expose the outmoded enclave of avant-garde and to position man ironically within the totality of his culture with a mechanical neutrality.[28]

As one way of strengthening such an interpretation, one could examine the instruments assembled here in place of the head and follow them through interwar society in Germany. Some of the instruments shown here resonate, for example, with the contemporary expansion of applied psychology and with the Taylorisation of the work place. A device somewhat similar in shape to the pressure gauge, the large indicator apparatus that replaces the face here, recorded the running times of production machines in big companies and was marketed, during the Weimar Republic, under the telling name 'company psychograph' [Fig. 4].[29] Various comments by Hausmann apparently support such an interpretation of the *Portrait of the Dadasoph*. Vis-à-vis the somewhat similar photomontage *Tatlin at Home* (1920), also showing a male figure with the head being replaced by an ensemble of contemporary machine elements, Hausmann once remarked: 'I preferred to portray a man who had nothing in his head but machines, automobile cylinders, brakes, and steering wheels.'[30] More than simply commenting on the predominance of technology in modernity, the *Portrait of the Dadasoph* documented the mutual adaptation of man and machine that had resulted from the large-scale application of technology to the workplace during this period.

Figure 4: The 'Betriebspsychograph,' from Fritz Giese, *Methoden der Wirtschaftspsychologie*, Berlin 1927.

In his talk on photomontage, delivered roughly ten years after fabricating these collages and at the occasion of an exhibition at the Kunstbibliothek in Berlin, Hausmann stressed again the political dimensions of this new genre. According to this lecture he used photomontage in order to come to grips with an environment that had been wrecked by the machinery of destruction: 'Dada … was a kind of criticism of the culture. [The Dadaists] were the first to use photographic materials to create a new unity that wrenched from that period of war and revolution a vision-reflection that was optically and conceptually new […] an image of the chaos of an age of war and revolution.'[31] One may agree with Hausmann that his photomontages exhibit an 'optically and conceptually new' reflection upon the human condition, but examples such as the *Portrait of the Dadasoph* demonstrate in their structures and details much more coherence and unity than 'an image of the chaos of war and revolution' suggests. The collage includes more ambiguous comments on the machine age than Hausmann's own critical reading here, as I will show in the following.

Engineering the self and consciousness

By its title, the *Portrait of the Dadasoph* was as much a portrait of its time as it was a self-portrait. While Johannes Baader was the 'Oberdada,' and John Heartfield the 'Monteurdada,' Hausmann was Berlin Dada's philosopher, as, for example, his business card indicated. Its text read: 'Raoul Hausmann, president of the sun, the moon, and the small earth (interior surface), Dadasoph, Dadaraoul, director of Circus Dada' and then in Latin 'Who diagnoses well, will cure well.' This enigmatic aphorism could allude to the strategy of therapeutic irony just discussed, but one should be careful before drawing such a conclusion.[32] Brigid Doherty has recently revealed a much more sinister twist in this photomontage. As she has demonstrated, the background photograph of a sitting man was taken from a cover of Weimar Germany's most widely read weekly, the *Berliner Illustrirte Zeitung*.[33] It was a photograph of Ernst Noske, the minister of defence who had called himself the 'blood hound of the new republic' when he assumed command in 1919 and immediately ordered the military suppression of the Spartacist uprising. On the basis of this material linkage, the photomontage adds to the injured portrait of a technologically transformed self the insult of the conflation of the person portrayed with the most questionable member of the new government. In Doherty's reading, this photomontage is a simulation and repetition of the trauma so widespread in Germany in this period, as she has demonstrated in another of her rich articles.[34] A set of strong evidence supports Doherty's interpretation of this photomontage as traumatic. Above all, her reading positions this collage fairly close to the mimetic strategy of Dada as alluded to here by the juxtaposition of Hausmann's prosthesis text and Benjamin's characterisation of Dada. In my view, however, mimesis does not function exclusively in a traumatic way here. In an analogue of the different layers of clippings,

photos, and cuttings in the work, this photomontage combines heterogeneous mimetic operations.

Hausmann's self-portrait already transgressed anthropomorphism by the employment of the new medium of photomontage, resulting in a clash of man and machine. This clash, however, did not destroy the figure of the human body but remained surprisingly fixed within its shape. The photomontage creates a blending of man and machine, and thus depicts the image of a technological reconfiguration of the human that results in a transformation of the biological body. The *Portrait of the Dadasoph* demonstrates a variant of playful mimesis as much as it reveals trauma; a willing confusion about body and machine is displayed here. The photomontage foreshadows as much a positive engagement with prosthesis as it decries its deleterious manifestations. It was this visionary understanding of prosthesis, only indicated here, that Hausmann was to develop much further over the following years.[35] For this reading, another detail of the photomontage is crucial, the combination of technological and surgical intervention that results here in a fusion of technology and biology. The device that has replaced the head is directly connected to the interior of the body and to the oxygenation of the blood. Is it too farfetched to speculate that the technological gadget supplies the human body with fresh blood? At least by his posture the man shown seems to be quite content with the transfiguration that has taken place; there are no signs of unrest or upheaval.

Such a visionary reading would connect with ideas of a technological utopia developed later by Hausmann, where he delves into a transgressive concept of prosthesis as a form of bodily engineering. Take, for example, his note on 'PRÉsentismus' from 1921:

> We want to be transformed … through mechanical consciousness, by the bold inventions of the forward-pushing engineer. Why can we no longer paint like Botticelli, Michelangelo, Leonardo, or Titian? Because man has completely changed in his consciousness, not only because we invented the telephone, the airplane, the electric piano, or the revolving lathe, but even more so because man's psychophysics has changed with his experience. The naïve anthropomorphism has come to its definitive end.[36]

This was in perfect accordance with Hausmann's conceptualisation of the role of technology in modernity:

> Today, and as a consequence of railway, airplane, photography, x-rays, we have acquired such a differentiability of our optical consciousness that by means of this mechanical increase of physical possibilities we have been liberated to new forms of

optical perception and to an extension of optical consciousness in a creative design of life.[37]

The prosthetic devices that have been attached to the human body here replace the human head. But the true challenge rests in their mode of operation as extensions of the body, as consciousness-enhancing technologies, as transformative powers of the biological. In order to develop this aspect of prosthetic photomontage any further, another genre within Hausmann's oeuvre has to be introduced; a different line of his work pursuing remarkably similar aims.

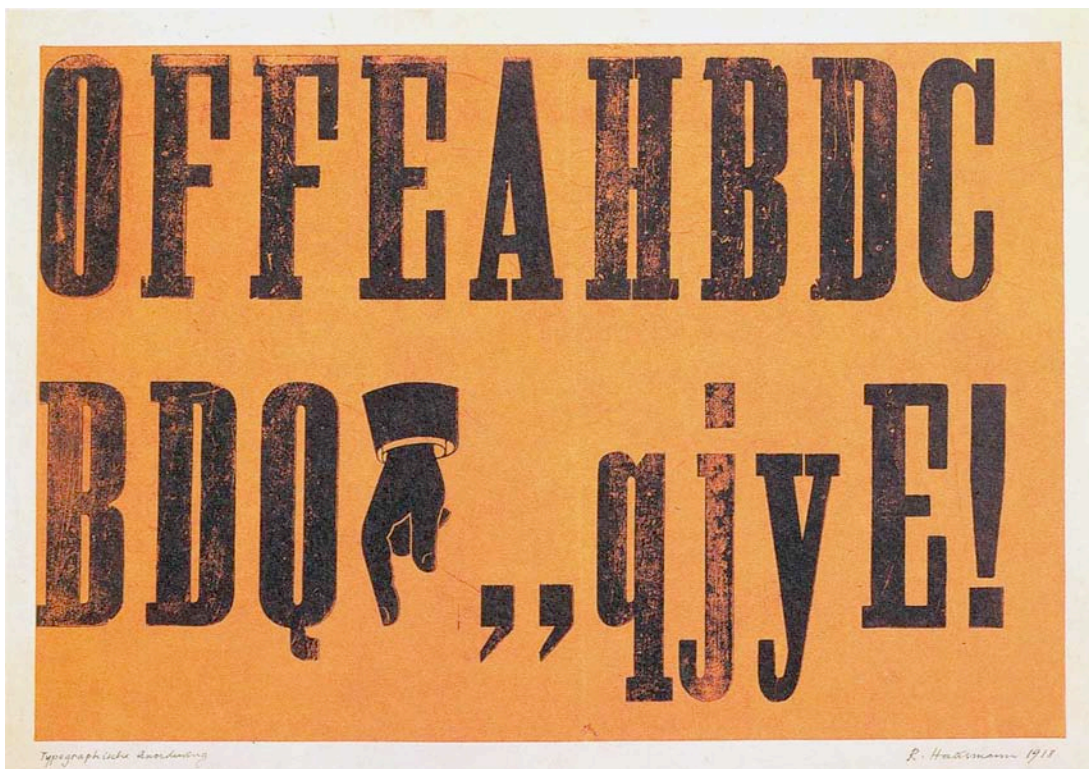## Typography and optophonetic poetry

Figure 5: Raoul Hausmann, *OFFEAH*, (optophonetic poem), 1918, print, 32.8 x 47.8cm, Berlinische Galerie, Berlin. © Estate of Raoul Hausmann/ADAGP (Paris)/SODRAC (Montreal) 2005.

Hausmann's interest in typography started as an exercise in the chance production of art. He asked a typesetter in front of his letter-case to pick characters at random, at first from the set with lower-case consonants, then from the upper-case vowels, and each selection was printed as a poster. The *OFFEAH* poem (1918) inadvertently reveals how this was not quite as revolutionary a strategy as proclaimed by Hausmann [Fig. 5].[38] The pointing hand the printer picked is certainly

not part of the traditional alphabet but had found its way into the letter-case because of the demands for more exceptional typography from the new business of advertising.[39] Typographic poetry is another example of how Dada was innovative in dealing with materials which themselves were fairly recent products of modernisation.[40]

OFFEAH was one of Hausmann's first typographic poems and demonstrates a somewhat limited development of the new form. The characters had been chosen at random and thereby liberated from the regime of semantics; in their spatial arrangement, however, they strictly followed one another in a line, obeying the conventions of printing and reading from left to right. Even in its rather narrow limits, this *écriture automatique* suggested already a new way of dealing with acoustics in poetry and its relation to typography. A more sophisticated example of this genre is *kp'erioum* from the following year (1919) [Fig. 6]. Here, the signs in the representational space of the paper functioned by themselves, so to speak, as instructions or guidelines for a performance of the poem, with small letters indicating a quieter sound, large or bold ones a louder voice, and with the spacing pointing to the intervals and duration of each individual sound:

> The characters of the acoustic poem are arranged so that their visual appearance directly represents their sound. The flow of the vowels appears to be visually blocked by the consonants; the graphical differences mediate spontaneously the representation of phonetic signs in the mind which our memory has become accustomed to translate into phonemes without difficulty.[41]

Typography in *kp'erioum* has been transformed into a system of sound notation by redefining the representational space of the printing paper in topographical terms. At the same time, however, the two dimensions of the representational space exert a new influence on the sound inscribed. The size of the paper in relation to that of the letters results in an arrangement of lines.[42] We can note, for example, the symmetry and visual balance of the roughly equal distribution or spread of single bold letters across the paper. Already on the level of graphical representation, there is a highly complex interplay of the phonetic and the visual. In this version of the work, the optophonetic poem has turned into a graphical arrangement and the spatial interplay has become more prominent; it is a poem and a piece of graphic art. There exists another version of *kp'erioum* in which Hausmann has exchanged the underlying photomontage for the first few paragraphs of one of his writings. The text is an example of Hausmann's highly idiosyncratic, almost automatic writing, blending kernels of philosophical insight with irony, repetition, absurdity and nonsense. In this case, the text ends literally in a series of non-syllabic, geometrical characters, further enhancing the metamorphosis of script into graphics that lies at the heart of *kp'erioum*.

Figure 6: Raoul Hausmann, *kp'erioum* [also under the title 'Schriftkonstruktion aus dem Dadaco'], (optophonetic poem), 1919, mixed media, 37 x 20cm, Berlinische Galerie, Berlin. © Estate of Raoul Hausmann/ADAGP (Paris)/SODRAC (Montreal) 2005.

It is less the versatility of the optophonetic poem or its amenability to Hausmann's performances which is of interest here, but the very multiplicity of levels at which these poems operate. With the disappearance or, in fact, the elimination of semantics, typography turned into an exploration not of the symbolic organization, but of the materiality of speech and language. The typographic arrangement of individual letters, separated from the order of meaning, dissected the inner workings of phonetic structures. And in doing so, the typographic poem re-connected with the performing body. Or in the words of Hausmann quoted above, 'the graphical differences mediate spontaneously the representation of phonetic signs in the mind which our memory has become accustomed to translate into phonemes without difficulty.' For the artist and inventor of this form of sound poetry, this may indeed have been 'without difficulty,' but even if this was the case, the typographic poem was rather based on a radical departure from the memorised sound signs and their internalised transformation into phonemes. These poems were exercises in strange forms of vocalisation and sound production. The materiality of language as

explored in the typographical arrangement resonated quite literally with an exploration of the materialities of the sound-producing body – its breathing rhythm, visual acuity, and registers of sound production, to identify just a few of them. The graphical interplay of the phonetic and the visual corresponded with a bodily interplay of the various senses and faculties involved. Fairly early on, Hausmann used the medium of photography to capture the complexities of the optophonetic exploration of the embodiment of sound and vision, photographing, for example, his performing instruments (mouth, eyes, and hands) or his gestures.

Optophonetic poetry had started as typographic play but it resulted in an exploration of human physiology, or in the words of Hausmann: 'Typography is an intermediate domain between art and technology, between seeing and understanding, and is one of the most obvious means for the permanent psycho-physiological auto-instruction of human beings.'[43] In this way, the performance of optophonetic poetry revealed, above all, the disabilities of the human body and the limits in the 'logic of the organs of the human body' that Hausmann was so interested in exploring. The typographic fusion of sound and vision outperformed the human body:

> Our prevailing consciousness is split into mechanics and functionality. Mechanics include physics, chemistry, and technology; sensory-physiological and psychological formations belong to functionality. The elements of human perception are of sensory-physiological and of structural-functional nature. … Each is limited by conscious and unconscious processes of selection and by the functional specificities of the sensory organs. These are the organic limitations and functional inhibitions of the human psycho-physical nature. The human will to creation and distraction effectuates an adaptability according to a logic of the organs which finally approaches an ultimate limit in approximation and adjustment.[44]

For Hausmann, this incongruence between optophonetic poetry and human abilities did not cause the failure of the new artistic medium. On the contrary, this making visible or tangible of its limitations counted as its biggest triumph, precisely because it called the human body into question. At this point, however, optophonetic poetry had served its part. For the further 'self-education of man,' art had to form an alliance with technology:

> It is necessary to point out a law as yet undiscovered by the sciences. The temporary balance, which is historically transformable, of humanity's organic deficiencies … is manifested in technical and artistic sublimation. Seen from this dialectical angle, revolutionary periods in art, technique, and society are complementary. This relational

aspect implies that a new conception … plays an important role in the transformation of social consciousness.[45]

The future belonged to 'a mechanical intensification of our natural faculties.' The Dadaist embarked on the construction of a sense-enhancing perceptual device, the optophone.
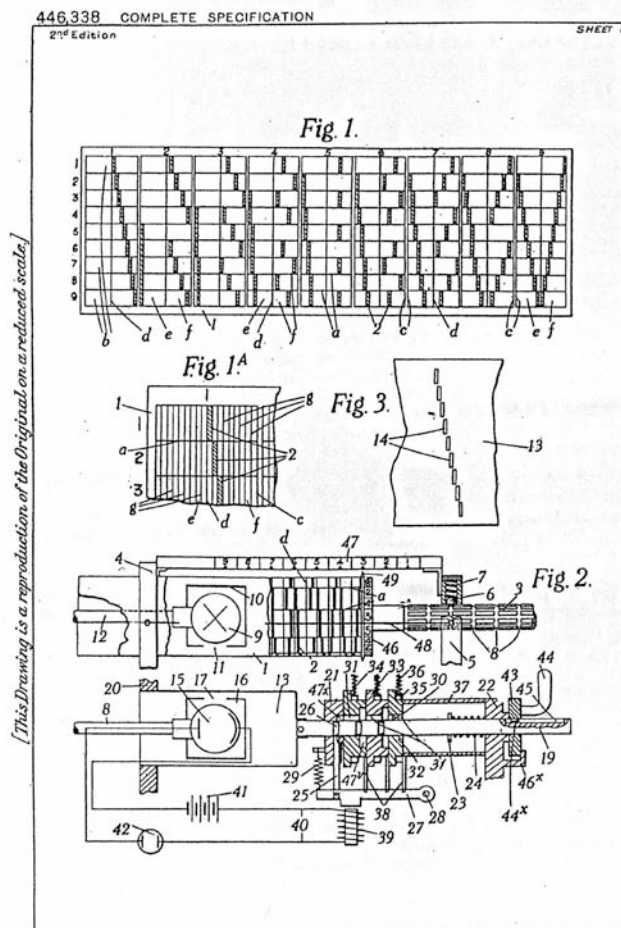
The optophone

Figure 7: Raoul Hausmann, *Optophone*, drawing from the British patent in 1936, from Hausmann, *Texte bis 1933*, Vol. 2, 1982.

Already at the beginning of the twentieth century, an 'optophone' had been patented. This apparatus was a prosthetic device, designed initially as a mobility aid for blind people and later, in another variant, as a reading device. The name simply illustrated its operating principle; the instrument transformed, by means of a photocell, light into sound. In its first version, the electric

circuitry generated sound in order to guide blind persons around obstacles, while the second type converted the different forms of characters and words into acoustic images enabling a form of reading by listening. With the new opportunities of electrical engineering many technological inventions emerged towards the end of the nineteenth century that explored zones of sensory modalities and their translation, such as the phonograph, the telephone, or optical telegraphy.[46] The optophone was just one example of a much larger family of now forgotten similar devices converting images into sound, which happened to be identified with the same name as Hausmann's construction. The optophone was first designed by the British physicist E. E. Fournier d'Albe and quickly gained sufficient publicity to appear twice in *Scientific American*, for example, once at the time of its patenting as a guiding device before World War I, and again as a cover story when the reading device had become available in 1920.[47] This is especially noteworthy in our context, since it relates to the larger political context of prosthetic design: to the demands for this generated by war and the related mass production of sensory-disabled young men that Hausmann had targeted with his vitriolic irony.

For Hausmann, in contrast, the optophone, as he envisioned it, was not a prosthetic device in medical terms. It operated rather as a scientific and/or artistic instrument that transformed light into sound and vice versa. The instrument was to enable the materialisation of synaesthesia in the form of a universal symphony of light and sound:

> The optophone transforms the induced optical phenomena back into sound by means of the selenic cell and the microphone coupled into the circuitry. … The series of optical phenomena undergoes a metamorphosis into a symphony, the symphony into a living panorama. Given the appropriate technologies, the optophone has the power, or better, the ability to reveal the sound equivalent of every optical phenomenon. Or put differently, the optophone exchanges the vibrations of sound and sight, since light is oscillating electricity as is sound. … Where is the new brain, the new organ that is first able to perceive clearly the ongoing transformation of our time-space-world?[48]

To Hausmann, the technological transformability of light into sound and sound into light had to be understood as a deep insight into nature since it revealed an underlying harmony in the cosmos. Modern technology demonstrated the coherence and concurrence of nature's forces across the differences between the senses. It thus manifested a need to develop the human body beyond its natural design in order to understand nature and to come to terms with the powers of modern technology. The optophone operated precisely in a gap between two human senses, where human evolution still had to go, as Hausmann suggested:

It is our task to work on the physical and physiological problems of nature and human nature in relation to a universal consilience and responsibility. We will have to start our work where modern science stops because of its in-objectivity as long as it pursues a system of exploitation and continues to take viewpoints related to worn out forms of civilization.[49]

Hausmann's optophone operated on the assumption that the human body was lacking something, that it needed less an enhancement (as in the case of hearing and seeing devices) than a supplement, a technological gadget transforming and mobilising human perception across the gap between the human senses. So in the end it was a prosthetic device serving not as a technological aid for blinded soldiers or blind patients, but as cosmic mediator of perception for physiologically 'disabled' humans. Thus, Hausmann's project connected with a whole range of artistic projects which aimed at combining sound and light during the 1920s, from Alexander Scriabin's light-music *Prometheus* to Thomas Wilfred's optical piano, the 'Clavilux,' to name just the two most prominent.

It is not quite clear, however, how far Hausmann developed his project in technological terms. Eventually, the instrument was patented – although not as an optophone in Hausmann's vision of such an instrument [Fig. 7].[50] The apparatus patented in England in 1936 was no longer a prosthetic device lifting human beings up beyond the limits of their discrete senses into synaesthetic sensory experiences. For the patent, the synaesthesia machine was turned by an engineer and friend of Hausmann into an optical calculation device, determining railway fares at high speed – it was no longer the vehicle of an augmented reality *avant la lettre*. Apparently, Hausmann never brought his vision of a technologically enhanced perception of reality to life. When he returned to the optophone in the booklet *La sensorialité excentrique*, which he prepared at the end of his life and which was published only posthumously, he included a reprint of his earlier essay 'Optophonetik' but gave his once visionary manifesto a significantly gloomy twist by adding the following preface: 'The intellectual habitus of human beings is conservative. … Human beings remain unchanged at all times, regardless of technological developments and prosthetic experiments.'[51] The tone of his analysis in these new essays had changed drastically. Instead of embracing technology and celebrating the new insights gained by them, Hausmann now painted a dark scenario of human society paralysed by comfort and laziness brought about by the very same prosthetic technologies:

Humankind has constructed the tools and the weapons for extending and increasing its organic abilities. But relying and resting on prosthetic technology — be them electronic devices or household aides — only leads to intellectual and moral stagnation. In fact,

man has to make up his mind to break away from these sedentary and lethargic tendencies. He should strive again to extend and to expand his intellectual and also his somatic abilities. … But since radio, electronics, and computer govern the information flow across the world, everyone conceals himself in a similar way. Atomic weapons increase further this synchronization and stream lining of thought and imagination.[52]

In Hausmann's work, a complex trajectory connects his photomontage cyborgs, his explorations into the typographic and psychophysiological interplay of the optophonetic, and finally his construction of prosthetic technology for translating one into the other. Theses activities rotate around the notion of synaesthesia, both in the sense of a harmony between the senses, and also, so to speak, in preparation for new sensory environments, of which there were more to come during the twentieth century. In contrast to the alleged revelations the new instrument was to bring, examples from Hausmann's photomontage technique and his optophonetic poetry demonstrate a striking exploration of an optical and acoustical unconscious of modern culture.[53]

Hausmann's optophone was designed to reveal the secret of the universe to the human senses but it did not live up to his expectations. The experimentalisation of everyday life proved more difficult than expected. Where Hausmann's experiments coincided with technoscience, they turned ironic play and bluffing 'auto-detoxication' into a new fixed metaphysic of cosmic unity. The artist turned scientist produced ideologies of the very nature that his artistic practices had often ridiculed. It is obviously difficult to outline precisely how some forms of experimentation by Hausmann became obfuscated in esoteric speculation while others nourished ambiguities in more productive and promising ways. The typographic experiments Hausmann had engaged in opened up a radical investigation of the materialities of communication and of the bodily interactions between image and sound as involved in the generation of symbolic acts. The optophone, however, reified this connectedness into a secret of nature to be revealed by modern technology and to be embraced by human consciousness. Hausmann mistook a playful form of experimentation and an ensemble of technological gadgets for another solution to age-old philosophical problems. Thereby, he reified an esoteric phantasm into a new ontology. Hausmann's vision ultimately faded away, as a 'Fata Morgana' of media technology.

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[1] 'Wir fordern die Erweiterung und Eroberung all unserer Sinne!' Raoul Hausmann, 'PRÉsentismus,' in Michael Erlhoff (ed.)*, Sieg Triumph Tabak mit Bohnen, Texte bis 1933, Bd. 2*, Munich 1982, 28. All translations from Hausmann's original German are mine unless stated otherwise.

[2] Eberhart Zrenner, *Subretinal implantierte Mikrophotodioden-Arrays zum Ersatz degenerierter Phtorezeptoren*, lecture presented at the 48th annual meeting of the Deutsche Gesellschaft für Klinische Neurophysiologie, October 8 to 12, 2003 in Freiburg/Breisgau.

[3] Gaston Bachelard, *The New Scientific Spirit* [1934], trans. from the French by Arthur Goldhammer, Boston 1984, 12f.

[4] On the relationship between Bachelard and the surrealists, see Mary Ann Caws, *Surrealism and the Literary Imagination: A Study of Breton and Bachelard*, The Hague 1966, and more recently Cristina Chimisso, *Gaston Bachelard: Critic of Science and the Imagination*, London 2001, especially 190-201.

[5] Bachelard, 'Le surrationalisme,' *Inquisitions* 1, 1936, 1-4.

[6] G. C. Waterston, 'Translator's preface,' in Gaston Bachelard, *Philosophy of No*, New York 1968, ix.

[7] Stelarc, 'From psycho-body to cyber-systems: images as post-human entities', in Joan B. Dixon & Eric J. Cassidy (eds), *Virtual futures: cyberotics, technology and post-human pragmatism*, New York 1998, 116-123.

[8] Cornelius Borck, 'Electricity as a medium of psychic life: electrotechnical adventures into psychodiagnosis in Weimar Germany,' *Science in Context*, 14, 2001, 565-590, and Borck, 'Urbane Gehirne. Zum Bildüberschuß medientechnischer Hirnwelten der 1920er Jahre', *Archiv für Mediengeschichte*, 2, 2002, 261-272.

[9] See Hans-Jörg Rheinberger and Michael Hagner (eds), *Die Experimentalisierung des Lebens. Experimentalsysteme in den biologischen Wissenschaften 1850/1950*, Berlin 1993; Philipp Sarasin and Jakob Tanner (eds), *Physiologie und industrielle Gesellschaft: Studien zur Verwissenschaftlichung des Körpers im 19. und 20. Jahrhundert*, Frankfurt 1998; and Borck, *Hirnströme. Eine Kulturgeschichte der Elektroenzephalographie*, Göttingen 2005, especially Chapter 3, 135-139.

[10] Walter Benjamin, 'Moskau' (originally published in *Die Kreatur* 2, 1927), in Michael W. Jennings, Howard Eiland, and Gary Smith, *Walter Benjamin: selected writings*, vol. 2, 1927-1934 (trans. Edmund Hephcott), Cambridge, Mass. 1999, 28.

[11] Hans Richter, *Dada: art and anti-art*, London 1965, 112.

[12] Hausmann, *Courrier Dada*, Paris 1958, 38, cited in Timothy O. Benson, 'Mysticism, materialism, and the machine in Berlin Dada,' *Art Journal*, 64: 1, 1987, 53.

[13] See, for example, Caroline A. Jones and Peter Galison (eds), *Picturing Science, Producing Art*, New York 1998; Timothy Lenoir, ed., *Inscribing Science: Scientific Texts and the Materiality of Communication*, Stanford 1998; and Linda Dalrymple Henderson, 'Editor's Introduction: I. Writing Modern Art and Science – An Overview,' *Science in Context*, 17:4, 2004, 423–445.

[14] On the 'surreality' of contemporary scientific objects, see Georges Canguilhem, 'Sur l'histoire des sciences de la vie depuis Darwin,' in *Idéologie et rationalité de la science de la vie: nouvelles etudes d'histoire et de philosophie des sciences,* Paris 1977, 101-119, and Bruno Latour, *We Have Never Been Modern*, Cambridge, Mass. 1993.

[15] They share with most objects of the modern technosciences their constructedness, but as products of culture, works of art operate under a different set of constraints. Objects of scientific

experimentation would conventionally be described, in the terms of this comparison, as non-fictional and non-artificial, that is to say, natural. However, it is this traditional epistemology that the concept of experimentation developed here aims at challenging.

[16] Richter, *Dada*, 101.

[17] Ernst Friedrich, *Krieg dem Kriege! = Guerre à la guerre!*, originally Berlin 1926, reprinted Frankfurt 1980.

[18] Founded by Franz Pfemfert in 1911, *Die Aktion* was published until 1932. It presented articles by many of the leading critics of Wilhemine Germany and it was this journal that provided expressionism with its platform.

[19] John C. Welchman, 'After the Wagnerian Bouillabaisse: critical theory and the Dada and Surrealist word-image,' in Judi Freeman, *The Dada & Surrealist Word-Image*, Cambridge, Mass. 1989, 73: 'Again, the efficiency of an analysis such as this is partly undermined by the tendency of Dada (in particular) to outmaneuver analysis through contradiction and sheer irascibility. This making-absurd paralyzes all attempts at systematization. … The purist strivings of the structuralist discipline were almost antithetical to the indiscrete practices of Dada, in which (almost) everything is already ironic.'

[20] 'Haudegen der Dadapolemik ... in Wort und Collage, in Tracht und Grimasse, der streitsüchtigste aufbrausendste Dadakämpfer.' See Walter Mehring, *Berlin Dada: eine Chronik mit Photos und Dokumenten*, Zürich 1959, 39f.

[21] 'Was'ne Prothese is, weiß jedes Kind. Für den gemeinen Mann so notwendig heute wie früher Berliner Weißbier. So'n Proletenarm oder Bein wirkt erst vornehm, wenn'ne Prothese dransitzt. Der Prothetiker ist also ein besserer Mensch, sozusagen durch das Verdienst des Weltkriegs klassengehoben. ... Ja, so'n brandenburger Kunstarm. Das könnte jedem passen. Was kann man mit dem alles machen. Zum Beispiel kochendes Wasser draufgießen, ohne sich zu verbrühen. Hält das etwa'n gesunder Arm aus? Der brandenburger Kunstarm ist das größte Wunder der Technik und eine große Gnade. Auch Schüsse gehen schmerzlos durch.' Hausmann, 'Prothesenwirtschaft,' in Erlhoff, ed., *Bilanz der Feierlichkeit, Texte bis 1933, Bd. 1*, Munich 1982, 137-138.

[22] Benjamin, *Illuminations* (trans. Harry Zohn), London 1992, 231. Since my English translation does not capture these qualities of the German original, I have to here rely on Benjamin's testimony.

[23] 'Der Bluff ist kein ethisches Prinzip, sondern praktische Selbstentgiftung;' Hausmann as quoted by Erlhoff, 'Raould Hausmann, der "Dadasoph". Eine regelrechte Montage aus sechzehn Texten,' in Alfred Paffenholz (ed.), *Spurensicherung Bd. 1: Kunsthistorische Nachforschungen über Max Raphael, Sergej Eisenstein, Viktor Schklowskij, Raoul Hausmann*, Hamburg 1988, 161, original source not cited.

[24] Robert A. Sobieszek, 'Composite imagery and the origins of photomontage, part 1: the naturalistic strain,' *Artforum*, 17:1, 1978, 58-65; Dawn Ades, *Photomontage*, London 1986, 19; and Hanne Bergius, 'Dada, the montage, and the press, catchphrase and cliché as basic twentieth-century principles,' in Stephen C. Foster (ed.), *Crisis and the Arts: The History of Dada, vol. 1: Dada, the Coordinates of Cultural Politics*, London 1996, 107-133.

[25] Cf. Clement Greenberg, 'The pasted-paper revolution,' *Art News*, 77, September 1958, 46-49, where he introduces these notions vis-à-vis Pablo Picasso, Georges Braque, and Cubist collage.

[26] Hausmann, 'Definition der Fotomontage,' quoted from the English translation in John Elderfield, 'Raoul Hausmann, four notes,' *Studio International*, 181, April 1971, 161.

[27] Craig Adcock, 'Dada cyborgs and the imagery of science fiction,' *Arts Magazine*, 58, 1983, 67.

[28] Timothy O. Benson, 'Mysticism. Materialism, and the Machine in Berlin Dada,' *Art Journal*, 64:1, 1987, 52.

[29] Cf. Fritz Giese, 'Methoden der Wirtschaftspsychologie,' in Emil Abderhalden (ed.), *Handbuch der biologischen Arbeitsmethoden*, section VI, vol. 2, Berlin 1927, 480f.

[30] Hausmann as quoted in K. G. Pontus Hultén, *The Machine as Seen at the End of the Mechanical Age*, New York 1969, 111 (originally cited in 'Tatlin at Home prend forme,' *Raoul Hausmann*, exh. cat., Stockholm 1967).

[31] Hausmann, 'Fotomontage' (1931), translated into English as 'Photomontage,' *Design Issues*, 14: 3, 1998, 67-68.

[32] The playful process of making absurd that abounds in Hausmann's oeuvre certainly prevents such a swift conclusion.

[33] Brigid Doherty, 'Figures of the pseudorevolution,' *October*, 84, 1998, 65-89.

[34] Doherty, '"See: we are all neurasthenics!" or, the trauma of Dada montage,' *Critical Inquiry*, 24, 1997, 82-132.

[35] There are plenty of articles by Hausmann in which he delves into a rather esoteric and enthusiastic theory of prosthesis as a truly mindful technology. Apart from the quotations above, see Hausmann, 'Biodynamische Naturanschauung,' in Eva Zürchern (ed.), *Scharfrichter der bürgerlichen Seele: Raoul Hausmann in Berlin 1900-1933*, Ostfildern 1998, 171-176; and Hausmann, 'Die überzüchteten Künste,' in Erlhoff, *Sieg Triumph Tabak mit Bohnen,* 133-144.

[36] Hausmann, 'PRÉsentismus,' 24-26.

[37] Hausmann, 'Die neue Kunst,' in Erlhoff, *Bilanz der Feierlichkeit*, 182.

[38] Hausmann, 'Poème phonétique,' in *Courrier Dada*, 63, and cf. Christian Scholz, 'Paralipomena zu: Sehtexte – Hörtexte,' *Bildende Kunst*, 37:11, 1989, 58-60.

[39] According to Cohen, developments of innovative and paratactic typography such as Marinetti's 'Words in Freedom' are made possible against a horizon of 'the placard, the sandwich man, the poster, the sign, the advertisement, the leaflet, the broadside, prospectus, prière d'insérer, ticket, handbill,' as 'typographic novelty began in the marketplace' (Arthur Cohen, 'The Typographic Revolution,' in Foster, and Rudolf E. Kuenzli (eds), *Dada Spectrum: the Dialectic of Revolt*, Iowa City 1979, 76).

[40] David Banash, 'From advertising to the avant-garde: rethinking the invention of collage,' *Postmodern Culture* 14:2, http://muse.jhu.edu/journals/postmodern_culture/v014/14.2banash.html (25 May 2005).

[41] Hausmann, 'Recherches sur le poéme phonétique,' *de Tafelronde*, Antwerp, 14:3/4, 1969, 107.

[42] Erlhoff notes the purposeful design of this optophonetic poem unlike earlier, strictly aleatoric works, cf. Erlhoff: 'Raould Hausmann, der "Dadasoph",' 155-197.

[43] Hausmann, 'Typographie' (1932), translated into English as 'Typography,' *Design Issues* 14:3, 1998, 71.

[44] Hausmann, 'Biodynamische Naturanschauung,' 171. Hausmann used the notion of the 'logic of the bodily organs' in several of his texts, see also, for example, Hausmann, 'Ausblick' and 'Denken und Darstellen,' in Erlhoff, *Sieg Triumph Tabak mit Bohnen,* 95-100 and 167-172.

[45] Hausmann, 'Formdialektik der Fotografie' (1932), translated in *Design Issues*, 14:3, 1998, 69-70.

[46] Cf. Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction*, Durham 2003, and http://oldweb.northampton.ac.uk/aps/eng/research/optophone/optophone.html (accessed 27 June 2005).

[47] E. E. Fournier d'Albe, 'On a type-reading optophone,' *Proceedings of the Royal Society* [London] A, 90 (619), 1914, 373-375; *Scientific American Supplement*, 74, 1912, 71 and *Scientific American*, 6 November 1920, front cover.

[48] Hausmann, 'Optophonetik' (1922), in Erlhoff, *Sieg Triumph Tabak mit Bohnen*, 51-54.

[49] Hausmann as quoted in Erlhoff, 'Raould Hausmann, der "Dadasoph",' 168 (original source not cited).

[50] Cf. Hausmann, 'Die überzüchteten Künste,' in Erlhoff, *Sieg Triumph Tabak mit Bohnen,* 133-144. Hausmann's optophone would require a much more thorough investigation than the one I can give here. The most detailed account is by Jacques Donguy, 'Machine head: Raoul Hausmann and the optophone,' *Leonardo*, 34:3, 2001, 217-220. The paper includes the photograph of a recent replica of Hausmann's optophone by the British artist Peter Keene. According to Donguy's research, the patent was granted in 1936 although Hausmann himself stated 1935 (cf. notes to Hausmann, 'Die überzüchteten Künste,' 214f).

[51] Hausmann, 'Vorwort,' in *Die exzentrischen Empfindungen*, Graz 1994, 19.

[52] Hausmann, 'Die neue Zivilisation,' in *Die exzentrischen Empfindungen*, 43-47.

[53] Hausmann's explorations of the articulation of the visual with the acoustic thus suggest an extension of Rosalind Krauss' analysis of Benjamin's optical reading of modernity; cf. Rosalind E. Krauss, *The Optical Unconscious*, Cambridge, Mass. 1993.

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