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Computers and Composition 22 (2005) 5–22

Computers  
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# Gains and losses: New forms of texts, knowledge, and learning<sup>☆</sup>

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## Abstract

In this paper, I look at what might be gained and what might be lost as we move from representation primarily through writing to representation primarily through image. In so doing, I also consider issues related to learning, knowledge, and human agency.

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*Keywords:* Communication design; Constellations and functions of modes; Forms of reading; Learning; Logics of mode; Multimodal semiotics; Representational change; Rhetoric; Traditional and digital media

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## 1. Framing

Central assumptions of multimodal approaches to representation and communication are (a) that communication is always and inevitably multimodal; and (b) that each of the modes available for representation in a culture provides specific potentials and limitations for communication (Kress & van Leeuwen, 1996). The first assumption requires us to attend to all modes that are active in an instance of communication; the second requires us to attend to the specific meanings carried by the different modes in communicational ensembles (Kress & van Leeuwen, 2001). All this goes together with a kind of common sense, widely shared about public communication, that there has been and continues to be realignment in culturally valued modes. In particular, it seems evident to many commentators that writing is giving way, is being displaced by image in many instances of communication where previously it had held sway.

This realization calls forth a variety of responses, mostly negative, ranging from outright despair, anger and nostalgia to some still utopian voices on the other end of the spectrum. The response is understandable given the long domination in the West of writing as the culturally most valued form of representation: and more, the long association of the mode of writing with the equally dominant, valued and powerful medium, namely the book. The fragmentation

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<sup>☆</sup> This paper was first presented as one of the featured sessions at the Conference on College Composition and Communication (CCCC) in San Antonio, Texas, on 26 March 2004.

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of the constellation of mode of writing and medium of book has given rise to wide cultural pessimism: responses ranging from the attempts to reimpose the communicational givens of the past, in school curricula for instance, to intemperate outbursts in the various media; with political, social, economic and cultural decline often all wound up together with this phenomenon in representation and communication.

The issue—given that representation, especially in the linguistic modes of speech and writing, is so closely bound up with social and ethical values—cannot be debated at the level of representation alone. It does, always, have to be seen in the wider framework of economic, political, social, cultural and technological changes. This is so because on the one hand representation is used as a metaphor for social, cultural, and ethical issues, and because on the other hand representational changes do not happen in isolation. The technologies of representation and those of communication and/or dissemination are everywhere bound up with the larger, wider changes in the (global) economy, in social and political changes, and in accompanying ethnic and cultural changes. Nor can technology by itself be treated as causal. It too ties in with and is rolled up everywhere in this complex. None of this is new. Yet it needs to be reiterated each time the issue is discussed, in mantra like fashion. Representation and communication are motivated by the social; its effects are outcomes of the economic and the political. To think or act otherwise is to follow phantoms.

## **2. A revolution in the constellation of modes and media**

In this context, the purpose of my talk is to provide essential ways of making sense of the changes in the landscape of communication, provide means of describing and analysing what is going on, and to provide means of navigating between the Scylla of nostalgia and pessimism and the Charybdis of unwarranted optimism. Tools are needed that will allow us to describe what is going on, and theories are needed that can integrate such descriptions into explanatory frameworks. In this context, the emergence of multimodality as a focus in representation, linked for me with a social semiotic theory to account for meaning making, offers the theoretical and descriptive possibility of looking at the issue of changes in representation in a historical perspective, freed from either nostalgia and despair or utopianism. It offers the possibility of a relatively clear assessment of what I call “gains and losses” both representationally and communicationally.

The semiotic changes are vast enough to warrant the term ‘revolution’, of two kinds; of the modes of representation on the one hand, from the centrality of writing to the increasing significance of image; and of the media of dissemination on the other, from the centrality of the medium of the book to the medium of the screen. The fact that these occur as constellations—medium of book with mode of writing and now medium of screen with mode of image—means that the effect has been experienced in an amplified form. The distinct cultural technologies for representation and for dissemination have become conflated—and not only in popular commonsense, so that the decline of the book has been seen as the decline of writing and vice versa.

I use the term “mode” for the culturally and socially produced resources for representation and “medium” as the term for the culturally produced means for distribution of these

representations-as-meanings, that is, as messages. These technologies—those of representation, the modes and those of dissemination, the media—are always both independent of and interdependent with each other. Each has its own quite specific powers and effects. As the constellation of book and writing had been so close and had existed over such long durations, the effects of each separately and of both jointly had not been separated out. It is essential that this should be done: They are distinct, with distinct affordances (for the modes) and distinct facilities (for the media) (Kress, 2003). To give just one, though a central effect of the facilities of the media, we can look at the figure of the author in relation to the medium of the book, especially in its traditional form, compared to the role of the author in relation to the medium of the screen.

What did this author know? As the author, J.W. Simms (1946) knew two things: He knew about his audience and he knew about his subject matter. About his audience he said, in the preface, “The prime instinct of almost any boy will be to make and to create. At seven he will ‘wire’ the whole house with his telephone system made from empty tins connected with varying lengths of string. . . His elder brother will improve on this by purchasing a crystal, a telephone receiver, a . . .” In other words, the author had insight into the life-world of his audience, and it is this that enabled him to assemble the materials that served to meet the second requirement; assembling and presenting the knowledge required for a specific need of the reader in that life-world. The author knew about the reader’s world, and that enabled him to work on the reader’s behalf to assemble the knowledge that would serve to meet a specific need in this instance. This knowledge was presented in chapters, each a coherent part of an overall body of knowledge presented in orderly fashion in the succession of chapters.

At this point, it is instructive to look at how this knowledge is set out: The chapters are numbered, and the assumption is that there is an apparent building from chapter to chapter: They are not to be read out of order. At the level of chapters, order is fixed. It is also fixed within the chapters and on the page in the reading path that organizes the reader’s encounter with the text on the page. We start at the top left corner, move across the page, start at the left of the next line, and so on. Order is firmly coded: the order of chapters, the order pages, of lines and of the line, and, of course, within lines as language, the order of syntax. Within this order, the reader encounters the respective entities to be read: textual, lexical, grammatical and/or syntactic entities—chapters, paragraphs, lines; words, letters, punctuation marks, spaces. So-called proper reading had assumed that the reader adhered to this order; the notions of “reading against the grain” or “resistant reading” are of a much greater recency than this text—first published in 1920 (Kress, 1984/1989).

We might stay with this example for a moment longer to see how reading worked. If order was fixed, as the order given by the author and naturalized by centuries of conventions of reading, then what was the reader’s task, and what or where was the reader’s freedom to act? My answer is that though order was given, strict, and in many ways fixed, the elements that the reader encountered along the route were quite open. Words are (relatively) empty entities—in a semiotic account they are signifiers to be filled with meaning rather than signs full of meaning, and the task of the reader is to fill these relatively vacant entities with her or his meaning. This is the task we call interpretation, namely interpreting what sign the writer may have intended to make with this signifier. We can easily check this with any text, though we will need to

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In the eighteenth century, when Benjamin Franklin performed his famous kite experiment, electricity was believed to be a sort of fiery atmospheric discharge which could be captured in small quantities and stored in receptacles known as Leyden jars.

Franklin was the first to prove that the lightning discharges taking place in the heavens are electrical.

The story of his experiment is very interesting.

He secured two light strips of cedar-wood, placed crosswise and covered with a silk handkerchief for a kite. To the top of the upright stick of the kite was fastened a pointed wire about a foot long.

The twine was of the usual kind, but was provided with a short piece of silk ribbon and a key. The purpose of the ribbon was possibly to prevent the lightning's running through his body, silk being a 'non-conductor', as will be explained a little farther on. The key was secured to the junction of the silk ribbon and the twine, to serve as a convenient conductor from which to draw the sparks—if they came. He did not have to wait long for a thunder-storm, and as he saw it gathering he went out with his son, then a young man twenty-two years of age. The great clouds rolled up from the horizon, and the gusts of wind grew fitful and strong. The kite felt a swishing blast and began to rise steadily, swooping this way and that as the breeze caught it. The thunder muttered nearer and nearer and the rain began to patter on the grass as the kite flew higher.

The rain soon began to fall heavily, compelling Franklin and his son to take refuge under a near-by shed. The heavy kite, wet with water, was sailing sluggishly, when suddenly a huge low-lying black cloud travelling overhead shot forth a forked flame, and the crash of thunder shook the very earth. The kite moved upward, soaring straight into the black mass, from which the flashes began to come rapidly.

Franklin watched the silk ribbon and the key. There was not a sign. Had he failed? Suddenly the loose fibres of the twine erected themselves. The moment had come. Without a tremor he advanced his knuckle to the key, and between his knuckle and the key passed a spark! then another and another. They were the same kind of little sparks that he had made hundreds of times with a glass tube.

Then as the storm abated and the clouds swept off towards the mountains and the kite flew lazily in the blue, the face of Franklin gleamed in the glad sunshine. The great discovery was complete, his name immortal.

(b) The cause of lightning is the accumulation of the electric charges

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STATIC ELECTRICITY

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in the clouds, the electricity residing on the surface of the particles of water in the cloud. These charges grow stronger as the particles of water join together and become larger. As the countless multitude of drops grows larger and larger the potential is increased, and the cloud soon becomes heavily charged.

Through the effects of a phenomenon called induction, and which we have already stumbled against in the experiment with the tacks and the magnetic chain, the force exerted by the charge grows stronger because of a charge of the opposite kind on a neighbouring cloud or some object on the earth beneath. These charges continually strive to burst across the intervening air.

As soon as the charge grows strong enough, a vivid flash of lightning, which may be from one to ten miles long, takes place. The heated air in the path of the lightning expands with great force; but immediately other air rushes in to fill the partial vacuum, thus producing the terrifying sounds called 'thunder.'

In the eighteenth century electricity was believed to be a sort of fiery atmospheric discharge, as has been said. Later it was discovered that it seemed to flow like water through certain mediums, and so was thought to be a fluid. Modern scientists believe it to be simply a vibratory motion, either between adjacent particles or in the ether surrounding those particles.

It was early discovered that electricity would travel through some mediums but not through others. These were termed respectively 'conductors' and 'non-conductors,' or insulators. Metals such as silver, copper, gold, and other substances like charcoal, acidulated water, etc., are good conductors. Glass, silk, wool, oils, wax, etc., are non-conductors, or insulators, while many other substances, like wood, marble, paper, cotton, etc., are partial conductors.

There seem to be two kinds of electricity, one called 'static' and the other 'current' electricity. The former is usually produced by friction, while the latter is generated by chemical or mechanical action, which we shall deal with in a later chapter.

A list of materials will be found in the Appendix placed in order of merit as insulators or conductors.

Warm a piece of writing-paper, then lay it on a wooden table and rub it briskly with the hand. It soon will become stuck to the table and will not slide along as it did at first. If one corner is raised slightly it will tend to jump right back. If the paper is lifted off the table it will tend to cling to the hands and the clothing. If held near the face it will produce a tickling sensation. All these things happen because the paper is electrified. It is drawn to the

Fig. 1. The boy electrician (content pages and pages of text).

assume a scepticism about words and their meaning and about words in syntactic arrangements that we have been taught to leave aside when reading. The still existing common sense is that meaning in language is clear and reliable by contrast, with image for instance, which, in that same commonsense, is not solid or clear.

So in the example above, we can start on the first line, with the locative and/or spatial preposition “in” and its metaphoric use here in a temporal environment; moving to the definite article “the” that seems so clear, yet is clear only in specific cultural contexts (for example, is what is meant “the” Chinese 18th century? or that of the Mayan calendar?) to the nominal *18th century* the obvious question “When in that century?”—“All throughout the century?” “At the beginning?” “Towards the end?”

Roland Barthes (1977) interestingly addressed this issue of the relative power of author or reader in 1968, in the context of a much wider challenge to power at that time. Theories of reading—as of language more widely—are ready, available, metaphors of the social. In reading the traditional page, the reader has to follow the strict order established by the writer while needing to interpret the word-signifiers, turning them into her or his signs. To illustrate the quantum change, the result of the changes mentioned earlier, here is a contemporary example:

As late as 1992, the Institute of Education (IoE), where I now work, represented itself in its prospectus in much the way as *The Boy Electrician*. What was being represented was the structure of the institution, its departments and units, its courses, and the regulations pertaining to them. The order was that of the institution, and the knowledge was that of the institution: why it could do that and why it was similar in its social and/or semiotic principles to those of *The Boy Electrician* is that the assumption—entirely implicitly made and held—was that the structure of the institution and of its knowledge were identical with the needs of the life-worlds of the individuals who might come to it as its students. Readers were assumed to adapt to that order in their reading and then in the manner of their interaction with the institution.

Writing was the dominant mode in the prospectus, though there were some (black and white) images. The current home page is profoundly different. It is not organized following the logic of the traditional written page but following that of the image-based logic of contemporary pages. Tellingly and more significantly, this page has thirteen distinct entry points where the 1992 page had one. We can rightly ask what the significance of that might be. My explanation has to do with the notion of order: The traditional page had one entry point—though being so naturalized by centuries-long convention, it was not even noticeable as a feature. It was an entry point given by convention and used by the author (and the readers), who, remember, knew about the world of the audience. Access to the power of authorship was strictly governed. Here, on the webpage, the presence of thirteen entry points speaks of a very different principle: the author(s) of this page clearly have in mind that visitors will come to this page from quite different cultural and social spaces, in differing ways, and with differing interests, not necessarily known to or knowable by the maker(s) of the page. There is no pre-given, no clearly discernible reading path, either of the home page or of each individual page, or of the site as a whole (the issue of navigation, where maps are relatively unreliable).

The existence of the different entry points speaks of a sense of insecurity about the visitors, a feeling of fragmentation of the audience—who now are no longer just readers but visitors, a quite different action being implied in the change of name.

The organizing principle of this new page is the (assumed) shape of the life-worlds of potential visitors and the interests that arise out of their life-worlds. What the visitors come to

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Before making an application, all applicants should be familiar with the general notices on page 22 of above.

Both homes and applicants from overseas who wish to teach in the United Kingdom after they qualify should apply through the Graduate Teacher Training Registry from whom terms of application and vacancy information are available from 1 September in the year preceding admission. The address is:

Graduate Teacher Training Registry,  
3 Crawford Place,  
London W1H 2BN.

In order to accelerate the despatch of GTR letters of appointment applicants are asked to enclose a self-addressed envelope, 10" x 7 inches, stamped 24p for second class, 30p for first class, or any equivalent postal label announced by the Post Office. In the case of applicants applying from overseas the equivalent in international reply coupons should be used. Applications as early as possible after 1 September in the year preceding admission is strongly advised. Applicants who are offered a place will be required to confirm acceptance or refusal of the offer within a fortnight.

**The Course of Study**

The course of study, designed to prepare students for work in any of the three stages of education, primary, secondary and further (1984 Act), will be based on partnership with schools and practising teachers and close integration with the curriculum and professional practice of the school.

\*Commonwealth applicants (not from Australia, Canada, Hong Kong, Sri Lanka) who wish to examine the possibility of study in the UK should apply through the GTR to the nearest British Consulate or Honorary Consulate, but should apply with the aid of their nearest section office or the British Council in their own country.

of theory and practice. The course will be school and classroom based and will include the following four elements:

- 1 Curriculum Subject Teaching
- 2 An Education component, which will cover an educational discipline
- 3 A Further Professional Option
- 4 Practical Training in Teaching

Each of the components seeks to elucidate the application of principles to practice and to help students to use the principles arising from the practical situations and problems they will encounter. The components are based on close co-operation with practising teachers, and seminars will be held in schools and the Institute giving students the opportunity to discuss questions raised in lectures, and to voice their own reasons for agreement or practical work in schools.

Every student is allocated to a supervising staff of which is headed either by a member of staff. Tutors have the role of helping students in all matters concerned with the course and students are encouraged to turn to their tutors if they have any problems or difficulties.

During the course of the year all students will gain experience of using computers.

**1. Curriculum Subject Teaching**

Candidates will study to an advanced standard the methods of teaching their special subject or subjects in the context of primary, secondary or further education. The areas of study will be:

- (i) methods of teaching a particular subject or subjects and the contribution of this or those subjects to the curriculum as a whole;
- (ii) the planning of learning experiences;
- (iii) classroom management;
- (iv) the use of educational aids;
- (v) evaluation and assessment.

Such other areas as may be determined by the Institute.

Articulate candidates will be undertaken in the return of the subject(s) or of the teaching programme for an age group, and of the philosophical, sociological and psychological problems involved. Aims and purposes of teaching particular subjects or groups of subjects, principles of curriculum and syllabus construction, studies exploring the use of appropriate apparatus, aids and materials for the learning of particular subjects or

**Postgraduate Certificate in Education**

topics in a school. Particular attention will be paid to the implementation of the National Curriculum.

The following courses are available:

**Art and Design Education** Graduates in any field of an end design are eligible to apply for this course, the main purpose of which is to prepare students for teaching posts in secondary schools. It is desirable that all candidates should have a broad experience of art and design. Those qualified in the history of art and design and art design will be considered for this integrated course in which practical work is an essential part. All candidates are required to bring to interview evidence of recent involvement in a broad-based approach to art and design in education which requires teachers to be flexible in their thinking and wide-ranging in their practical skills. Students are helped in developing personal objectives for teaching which are set in a deepening awareness of their own creative processes and an understanding of current curriculum ideas. Throughout the course major examinations and galleries are used as rich resources for learning. (Admissions Tutor: Tony Penning, BED MA FRSA).

**Business Studies** This course is specifically designed for those who wish to teach the integrated TVEI, GCSE and A and AS level courses in Business Studies. It provides a grounding in the wide range of business education courses, and includes applications of technology and business education with technology as a core component of the National Curriculum. Those applying should have good degrees in Business Studies or closely related subjects. Other candidates will be considered, particularly those who have significant and relevant business experience. The ability to handle basic statistics is essential, although this does not mean that such topics should have been part of the applicant's degree course. Applicants with no business experience are recommended to undertake a period of direct contact with a firm or organization as a part of their course work. (Admissions Tutor: D H Dyer, BSC (Tech))

**Business Studies, Economics and** see under Economics and Business Studies.

**Computing, Mathematics and** see under Mathematics and Computing.

**Economics** This course is intended to provide materials for the learning of particular subjects or

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The screenshot shows the homepage of The Institute of Education (IoE), University of London. At the top, there are navigation icons for Press office, Bookshop, Library, and Expertise, along with an 'ADVANCED SEARCH' bar. Below this is a 'Spotlight' section featuring a lecture on '17 November John White on the myth of multiple intelligences'. To the right of the spotlight is a box for 'SES book awards' where authors are awarded first, second, and third prizes. At the bottom, a message states: 'Temporary alternative access page to unaffected services (library catalogue, etc) if our main site is down.'

(b)

Fig. 2. IoE prospectus and IoE homepage.

find is not knowledge but information; in this new semiotic world, it is the readers who fashion their own knowledge, from information supplied by the makers of the site. That corresponds to a profound change in the situation of authors, readers and knowledge: "Information is material which [sic] is selected by individuals to be transformed by them into knowledge to solve a problem in their life-world" (Böck, 2002, 2004). The order of this page and of the whole site is open—I won't even say relatively open, because even though the site and its potentials are constructed and structured and the designers of the site imagine the possibilities of reading, they are not enforced and the possibilities are large.

The principle of design underlying the IoE website is now the semiotically increasingly dominant one: The (imagined) interests of the visitors provide the principles for and of the ordering and/or structuring of the message-entities (it is not clear whether the use of the term page is still useful and apt, or whether it has now become too metaphorical not to be a problem) (Kress, 2003). This is so not only with websites (and their pages) but is increasingly becoming the case with paper-based media—whether newspapers, books and particularly information books (Moss, 2001), magazines but also television screens in differing genres of programming. We might summarize some of the changes in this way:

**1929** (publication year of *The Boy Electrician*) and **1992** (publication year of *IoE Prospectus*)

- Given order, order designed by author.
- Page and book with single entry point.
- Knowledge produced by author on behalf of the audience.
- Author knows the life-world of audience and its requirements.
- Reading path fixed (though “naturalized” and hence invisible).
- Author fixes reader’s “point of departure”.
- Writing dominates the organization of the page.
- Writing is the dominant mode for the presentation of material (image as illustration).
- Use of mode governed by long-established convention: canonical use of modes.

**2004**

- Open order, order designed by reader.
- “Page” site with multiple entry points.
- Knowledge produced by visitor/reader in accord with the needs of their life-world.
- Page and/or message designers imagine the assumed characteristic of the life-world of their audience.
- Reading path designed by reader and/or visitor.
- Reader designs/selects her/his point of departure.
- Image dominates the organization of the “page”.
- Image and writing potentially co-equal for the presentation of material.
- Use of mode governed by “aptness”, insecurity about or absence of canonical modes.

There are revealing changes in vocabulary: for instance, from write (and read) to design; from reader to visitor, from page and/or text to message-entity; and others no doubt. And there are equally revealing changes in the principles of representation and organization: from the densely printed (relatively) mono-modal page to the multimodal screen and the new pages; from the conventions of page production to the mode of layout; from writing as dominant to image as dominant.

### **3. “Affordances”: Logics of modes; principles of ordering, and wording versus description**

In an attempt to gain new insight into possibilities for representing, multimodal descriptions—and multimodal semiotics in particular—have turned away from the enchantment of linguistics with abstraction that had dominated the 20th century. That it had been a response to the prestige and power of the natural sciences and tried to turn linguistic phenomena as near as might be achieved into a resemblance of those that would mirror the phenomena of the natural sciences. By contrast, the emphasis in multimodal work is very much on the materiality of the resources for representation. One consequence is that a concept such as language is itself beginning to lose its plausibility, for at least two reasons: On the one hand, the material differences between speech and writing are so significant as to lead to real differences in the potentials of each for representation, a difference that can hardly be subsumed and accommodated under the one label; on the other hand, speech and writing are themselves composed of such diverse phenomena as to make it difficult to regard each as a unified, homogeneous resource. If we ask, “what do pitch-variation, syntax, vowel quality, energy variations (producing loudness and softness), lexis or textual organization actually share in common features?” then the answer, I take it, is “nothing”. These are features—and the same kind of question can be asked of writing—of entirely different nature held together by the device of “grammar”, a construct used to clamp together a set of diverse phenomena to produce the complex and diverse resources for representation that we call speech and writing. “Language”, a label used to unify such already internally diverse resources, is, in that context, simply an abstraction of doubtful usefulness.

This then leaves the task of finding principles that will show the “affordances”, distinct potentials and limitations for representation of the various modes. I use the term logics based on the difference in organization using the possibilities of time and organization using the possibilities of space. Each rests on the material specificity of modes. Speech uses the material of sound—perturbations, changes of pressure, in the air, received and/or interpreted as sound by the ear. This happens in time: alternations in pressure (as well as pitch variation—changes in the frequency of vibration of the vocal cords) take place in temporal succession. One sound happens after another, in language one word after another, one clause after another. Time and sequence in time provide the organizing principle for making meaning. Sequence is used to make meaning; being first has the potential to mean something other than being second or being last.

The meaning attached to first and second and last depends on the culture that has fashioned this resource into syntax and texture. Being first may mean being first in the speaker’s attention (the theme of a sentence), or being first in power (the actor in a transitive clause), or being cause of an action, and no doubt many other possibilities. In a sentence such as “Jeremy married Amantha”, Jeremy might be occupying first position because he is actor in this action and/or event, or because he is the one who was responsible for this action, or because I am closer to Jeremy as my friend than I am to Amantha; and indeed, he may have been causal in this event. In the two sentences “The sun rose and the mists dissolved” and “The mists dissolved and the sun rose”, one clause rather than the other being first has effects on meaning: Not only is a causal relation implied, but there is a suggested shift in worlds: one the everyday world of everyday meteorological events, and the other the mystical world of mystery or fairy tale.



Sequence has effects for authorship and for reading. Hearers (and readers to a somewhat lesser extent) depend on the “unfolding”, the revealing of elements one after the other to be able to make sense of the whole. This gives authors a specific power: readers are dependent—at least in their initial hearing and reading—on sequence and on sequential uncovering. It is the author’s order, as mentioned earlier, that dominates, initially at least. If the hearer or the reader wishes to reorder what has just been said or what has been written, the recording has to be done on the basis of and against the author’s prior ordering.

The logic of space works differently: In the message entity (the image), all elements are simultaneously present—even though they were, of course, in many forms of image—in drawing or in painting, though not in photography—placed there in time and even though the viewer traverses the image-elements in time. And so it is the viewer’s action that orders the simultaneously present elements in relation to her or his interest. In spatially organized representation, the elements that are chosen for representation are simultaneously present, and it is their spatial arrangement that is used to make (one kind of) meaning (see Figures 1 and 2).

In Figure 3a Georgia stands on the right hand side of her mother; in Figure 3b she stands between her parents. I will not elaborate any more than I did in relation to the linguistic examples. In Figure 3b Georgia is the centre both of the representation and of the family (she

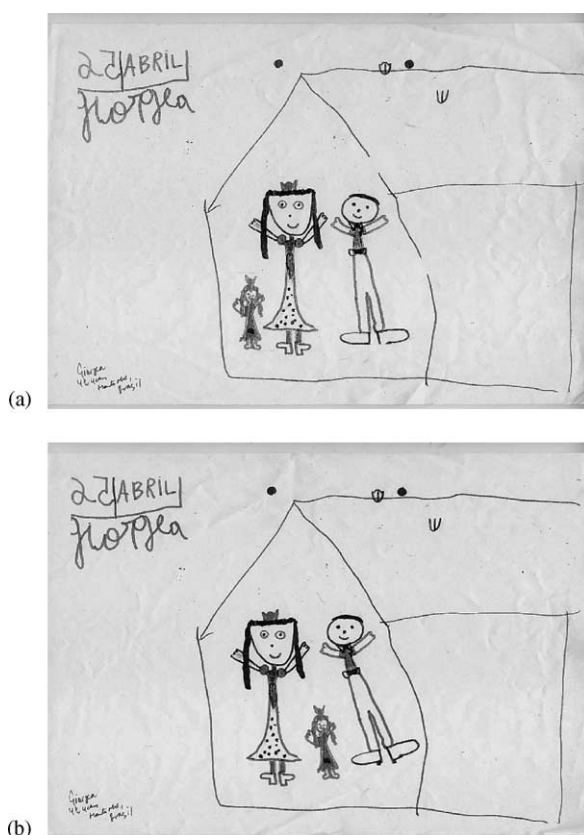


Fig. 3. (a and b) Georgia’s family.

was then the only child), framed by her parents; in [Figure 3a](#) she is on the outside of the group, though next to one parent—nearer to her mother and consequently more distant from the other. The relations between the three participants in the two images are structured and represented as being profoundly different. The means for making these meanings are the resources of spatial and simultaneous representation. Georgia has used other affordances of the spatial mode: size for instance. In reality, she was, at that time, taller than she has represented herself here; hence, her size is the representation and/or sign of an affective meaning: affectively she sees her parents as so much bigger. She has also used placement in the framed space, so that her father is, so to speak, lifted off the ground by several inches; in reality he was much shorter than his wife, but Georgia's sign endows him with the same height, though remaining accurate about his actual size. Colour is also affectively used: Her mother is drawn as much brighter, much more colourful than her father, more even than she has drawn herself.

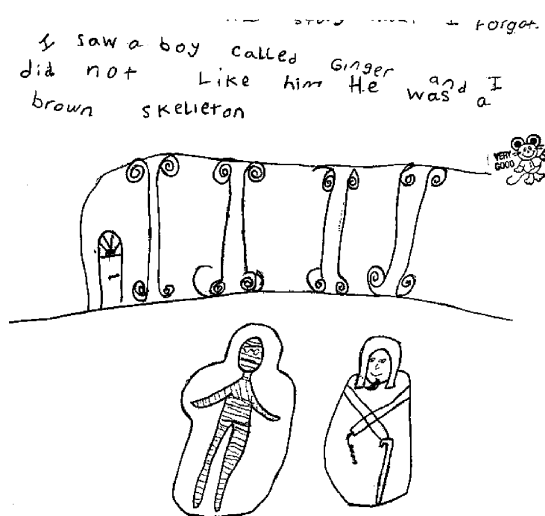
The temporal and sequential logic of speech, and, leaning on speech, of writing, lends itself to the representation of actions and events in time; hence, the ubiquity of forms of narrative in human cultures; hence also the ubiquity of the event and action oriented uses of speech and writing. The question asked by speech, and by writing, is: “what were the salient events and in what (temporal) order did they occur?” The spatial and simultaneous logic of image-representation lends itself equally readily to the representation of salient entities and their (spatially expressed) relations. Display is, in respect to its prominence and significance and ubiquity, the analogue of narrative. The question asked by display is: “what were the salient entities in the visually encountered and recollected world, and in what order are they related?”

From these affordances, and from these logics, develop distinct ways of representing the world. In [Figure 4](#), this is shown in the visual and verbal representation of a day at The British Museum in London. On the day after the visit by a class of 6-year-olds, the teacher asked the class to “write a story and draw a picture of our visit”.

This example is entirely typical of the drawings and stories done by the children in this class. The “story”—a recount—is a chronologically ordered sequence of action-like events, realized here as actional clauses. The day, as recollected in the mode of (speech-like) writing was a day of action-events. The picture, by contrast, shows the salient recollected entities: the façade of the British Museum, as the backdrop to the other salient entities, two mummies, symmetrically arranged. This is not a story, not a recount, but a display: What is being displayed is a selection of elements encountered during the visit to the museum and recollected on the following day. The day, as recollected in the mode of image, was a day of encountering significant objects in a particular space. There is no hint of narration.

The logics supply the raw stuff from which principles of ordering and their meanings are derived. The syntax of speech and of writing are developments from and elaborations of these. Similarly, the arrangements of visual representation, which we can also aptly call syntax, are also developments and elaborations from the logic of spatial display.

Materiality goes beyond the logics of modes: The materiality of sound offers potentials, as mentioned earlier, which different cultures have made use of in their different ways, and still do make use of: similarly with the materiality of graphic representation. We can take, as an instance, the matter of framing and investigate how framing is done in temporal and in spatial representations: in sound by pauses and silences, by lengthening, by intensifying and attenuation; with graphic matter through spaces, lines, spatial separation and connection,



The British Museum

*When I got to the museum it looked bigger than I thought. When I went in I took off my coat and went into the men's toilet and after I ran upstairs and after I ran upstairs I went into the lift. Then I went to see the mummies and all those stuff. Then we went to our cloakroom so we can get our coat and then we went to Waterloo station on a tube and a train to Clapham Junction and walked back to school and went home very happy and I told my mum, sister and my brother. The end.*

Fig. 4. Visit to the British Museum.

through punctuation marks of various kinds, colour bands, and so on. Materiality affects the core of representation: In speech through sounds as vocalic or consonantal conjoined into syllables that, when they become joined with meanings, change their character and function to become morphemes.

Speech and writing are, above all, modes founded on words in order, and image-representation is founded on depictions. The crucial difference is that words are highly conventionalised entities, and only exist in that manner. Otherwise, a sound-sequence—once taken out of the environment in which it was used—becomes difficult to interpret. Consequently, the stock of words in any one culture is always finite at anyone moment—though, of course, it is continuously augmented from moment to moment. What is crucial is that if there is no word, then the possibility of representation and communication is ruled out. Only that which is worded can enter into communication; or else, that which is to be represented gets squeezed into the ill-fitting semantic shape of the existing word. Because words rely on convention and on conventional acceptance, words are always general and, therefore, vague. Words being nearly empty of meaning need filling with the hearer and/or reader's meaning. (Semiotically, words are signifiers, not signs: When they are used in representation they become signs—of the maker and of the receiver and/or remaker.)

We treat that as the act of interpretation. With depiction and with images the situation is different: that which I wish to depict I can depict, at the moment at any rate. I can draw whatever I like whenever I like to draw it. Unlike words, depictions are full of meaning; they are always specific. So on the one hand there is a finite stock of words—vague, general, nearly empty of meaning; on the other hand there is an infinitely large potential of depictions—precise,

specific, and full of meaning. The former tend to occur in the fixed order of syntax, line, page, text; the latter tend to occur in an open order fixed by the reader and/or viewer's interest. This leads to the paradox of speech and writing as having a finite number of open, relatively vague elements in fixed order, and image or depiction having a possibility of infinitely many full, specific elements in an open order.

At this point, and with these tools, we can begin to ask the question of gains and losses, in the move from one mode and its arrangements to another mode and its different arrangements.

A final point to be made here is that of epistemological commitment. It arises from all that I have indicated. A small example will make the point. If I say, "A plant cell has a nucleus", expressing this bit of knowledge through the mode of writing (or speech) I have to relate the entity "plant cell" with the entity "nucleus" via the verb "have". This expresses a relation of possession, of ownership. In many languages, such as English, or French, or Farsi, or Urdu—languages of the Indo-European family—this is unavoidable. I have to use a word expressing a specific kind of relationship between cell and nucleus. When I draw a cell, say to demonstrate what it might be like, on a whiteboard, I will draw a circle-like entity and place a dot somewhere in that circle. I do not have to express anything about the characteristics of the relation between nucleus and cell—the spatial arrangement does that for me. However, anyone looking at the drawing is entitled to infer that where I have placed the dot is where the nucleus is supposed to be. The mode of depiction forces me into an epistemological commitment, different to that which writing also forced me to make. One is about position in a framed space; the other about a type of (named) relation. One asks questions that point towards causality, agency, power; the other asks questions about position in space, about relations of entities in the (framed pictorial) space. One has elements that are vaguely specified; the other elements that are fully specified. One has a fixed order, given by the author; the other a (relatively) open order established and/or designed by the viewer. One is a world in which causality is just about inescapably there; the other a world in which causality barely figures.

Speech and writing tell the world; depiction shows the world. In the one, the order of the world is that given by the author; in the other, the order of the world is yet to be designed (fully and/or definitively) by the viewer. These are not only different positionings in the world and to the world, with different epistemological positions and commitments, they also bestow different powers on the makers and remakers of representations.

#### **4. Beyond critique to design: Interest, subjectivity and rhetoric**

Over the last five decades or so, social framings and attitudes to representation have been transformed in response to or in line with social changes. Whereas, in the 1950s there was a clear sense of convention in relation to representation in speech or in writing, where it appeared under labels such as competence, or mastery, and maybe others, such as elegance, etc. In the late 1960s and in the 1970s that sense was replaced by the term critique. Convention is the result of social power over time, expressed in the form of laws and rules. It takes but little work to uncover the homologies that exist between the social conventions and their appearance as linguistic rules. As language can be described as a natural phenomenon, linguistic rules can be described as natural rules, and these natural rules are used as both metaphors for the

social and as means of enforcing the social conventions. Competence is then both social and natural and more potent for seeming the latter rather than the former. Competence expresses a common acceptance and implementation of rules; all those who share the same competence are (naturally and) socially the same.

Critique attempted to unsettle the naturalization of the social and did so particularly through showing the workings of power, whether in representation and communication or elsewhere. However, critique in communication necessarily works on what has been, what is established, and on the agendas of others—it looks back at what has been done by others. It challenges the existing configurations of power and expects that in exposing inequities more equitable social arrangements could be developed. In terms of representation that would amount—at that time when the focus was clearly linguistic—to lessening the effects of power and its realization in linguistic form.

Those who participated in the project of critique in more general terms had the intention of bringing systems and structures into crisis: that was, of course, very much the climate of the times, even though paradoxically it happened when the system had already come into crisis. In retrospect it is clear that aspects of the formerly seemingly fixed social arrangements were already creaking and breaking up. Now, in the early part of the 21st century, there is no need for bringing the social into crisis: It decidedly is. Hence, the project of critique seems somewhat beside the point. In the domain of representation and communication, the crisis manifests itself at every point: genres are insecure; canonical forms of representation have come into question; the dominant modes of representation of speech and writing are being pushed to the margins of representation and replaced at the centre by the mode of image and by others. The once dominant paper-based media—the newspaper and the book above all—are giving way to the screen, or, in as far as they remain as powerful media, are shaped in their appearance, form and function by the appearances and forms of the newly powerful, the now mythically and increasingly actually dominant medium of the screen.

As one effect of the social and the representational changes, practices of writing and reading have changed and are changing. In a multimodal text, writing may be central, or it may not; on screens writing may not feature in multimodal texts that use sound-effect and the soundtrack of a musical score, use speech, moving and still images of various kinds. Reading has to be rethought given that the commonsense of what reading is was developed in the era of the unquestioned dominance of writing, in constellation with the unquestioned dominance of the medium of the book.

In many ways, it will repay to look once again at the etymology of the English word “read”, and its origins in a family where it meant things like advice (the English “-red-” in the name Ethelred or the “-read-” in the epithet “unready”; or the German word Rat, counsel or advice, but also Rätsel for riddle or mystery). Reading as taking meaning and making meaning from many sources of information, from many different sign-systems, will become the new common sense. But the example of the IoE webpage also shows another crucial change in the meanings of “reading”: namely what I have called “reading as design” (Kress, 2004). In relation to message entities (texts?) such as that, the reader finds her or his way around the matter presented on that page, and orders it according to principles, as I suggested, that arise from the reader’s life-world. In effect, out of material presented (by an author, designer, and/or design-team?) on a page, the reader designs a coherent complex sign that corresponds to the

needs that she or he has. That is a profoundly different notion of reading than that of decoding, the dominant version for many decades and made iconic by the electrical engineering model of Claude Shannon and Warren Weaver (1949).

The new constellation of image and screen—where screen, the contemporary canvas, is dominated by the logic of image—means that the practices of reading becoming dominant are the practices derived from the engagement with image and/or depiction in which the reader designs the meaning from materials made available on the screen—and by transference back to the traditional media—on the new kinds of pages, which are now also organized on these principles and read in line with them.

Where with traditional pages, in the former semiotic landscape, it was the power of the author that ruled, here, it is the interest of the reader, derived from the contingencies and needs of their life-worlds. Of course, this is stating the matter in extreme form: Traditional pages will continue to exist, for a variety of reasons: For one thing, this revolution is generation-related; for another, it inevitably has a power dimension: The elites will continue to use writing as their preferred mode, and hence, the page in its traditional form. And then there is the fact of affordance; representations that rely on the affordance of the mode of speech and writing can now do so for that reason. Stories will continue to be told, and narratives will continue to be written—because the two modes are apt means for doing so. But it is essential to keep an open mind on this. Figure 5 shows a page from W.G. Sebald's (1998) novel *The Rings of Saturn*.

One feature of Sebald's novels is that intensely ordinary, banal images appear on the pages. My hunch is that he used them for the reasons that I have hinted at: different forms of engagement with the world, different modes of reading, different pace—out of the temporal, into the spatial.

If the changed notions of reading are bringing about changes in what readers are, then new modal uses and new media are having equally profound effects on writing and on the

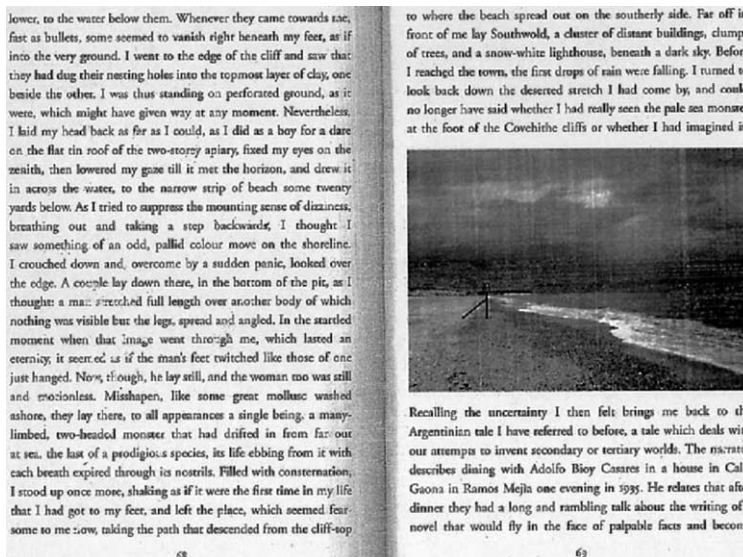


Fig. 5. The beach at Walberswick from *The Rings of Saturn*.

notion of author and of authority. The screen offers the facility in ways that the book did not do overtly or concretely offer for the reader to become author, even in the process of reading. I can change the text that comes to me on the screen. My means of disseminating my message are now much like those of other authors. That factor, of course, brings about a radical change to notions of authority: When everyone can be an author authority is severely challenged. The social frames that had supported the figure of the author have disappeared or are disappearing and with that the force of social power that vested authority in the work of the author.

The new media make it possible to use the mode that seems most apt for the purposes of representation and communication: If I need to represent something best done as image I can now do so, similarly with writing. Aptness of mode to the characteristics of that represented is much more a feature now—it is a facility of the new media. Aptness of mode and what is represented is not the only issue: Equally significant now is the aptness of fit between mode and audience. I can now choose the mode according to what I know or might imagine is the preferred mode of the audience I have in mind. This links directly to the crisis in both social framings and in representation: If I can now no longer rely on convention to make my audience take information in modes that are not congenial to them, then questions of my relation to the audience have to become foregrounded, hence the re-emergence over the last two decades of the issue of rhetoric. It is not that rhetorical issues did not exist prior to that, it is that prior to that I could rely on the grooved, habituated forms whether in text-type or in mode or in medium. That certainty is gone; each occasion of representation and communication now becomes one in which the issue of my relation to my audience has to be newly considered and settled on.

The new freedoms for authors and readers bring changes in practices: The question of rhetoric makes my subjectivity in this instance of communication now an issue each time anew. Presenting myself as the appropriate subject for this occasion of communication means that I am each time performing, staging, myself. When there is no stability to authorship or readership that has to be produced each time for this audience, on this occasion. So, whether in choice of genre, in choice of medium or in choice of mode subjectivity is at issue.

Figure 6 shows a now entirely usual teaching aid: textbook pages in school science are like that; forty, even thirty years earlier they would have been covered in writing. It is possible to ask the questions I had asked earlier: What does reading mean here? How is this page read? Which mode is dominant? Which mode carries which kind of information? What kinds of information are not focussed on here? What is the reading path—if any? and so on. The question I want to pose here, however, is different: What is the assumed subjectivity of the students to whom not just this aspect of the curriculum but nearly all of science is presented in this manner? And equally, what is the subjectivity of the science teacher who teaches science in this manner? We might imagine an answer by comparing textbook pages of this kind with textbook pages of some forty years ago and ask about implied notions of convention, of competence, of knowledge, and of authority. We would also, of course, need to ask about the subject matter of science itself, when its canonical forms of representation have moved from those of the traditional text-book to those such as here, or equally distinct, to those students now encounter in CD ROMs (Jewitt, 2003).

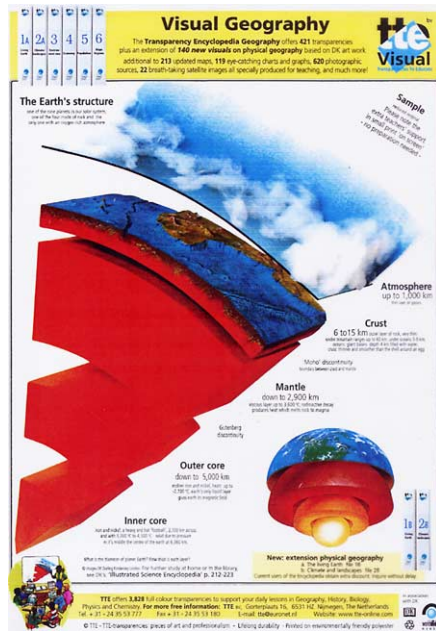


Fig. 6. The Earth.

## 5. Apt theories of meaning, learning and writing

It seems clear to me that we cannot continue with existing theories of meaning given the facts of the changes in the social, economic and cultural domain. At the moment, our theories come from the era dominated by notions of conventions and competence, whereas we need theories apt for an era of radical instability. Instead of competence in relation to stable social frames and stable resources for representation, we need the notion of design, which says: In this social and cultural environment, with these demands for communication of these materials, for that audience, with these resources, and given these interests of mine, what is the design that best meets these requirements? Design focuses forward; it assumes that resources are never entirely apt but will need to be transformed in relation to all the contingencies of this environment now and the demands made. The focus on transformation rather than on acquisition makes the designer agentive—in relation to existing socially and culturally made resources, social environments in specific, with the designer's interests in this occasion of design and in relation to that audience (Jewitt & Kress, 2003).

Agency of the individual who has a social history, a present social location, an understanding of the potentials of the resources for communication, and who acts transformationally on the resources environment and, thereby, on self are requirements of communication. Where critique unsettled, design shapes, or has the potential always to shape. It makes individual action central, though always in a field saturated with the past work of others and the present existence of power.

Semiotics does not deal with learning; just as pedagogy or psychology do not deal with signs. However, the process described here is in my view a description of the pro-



cesses of learning: transformative engagement in the world, transformation constantly of the self in that engagement, transformation of the resources for representation outwardly and inwardly.

## **6. Gains and losses**

I have suggested some means for making inroads into the question of gains and losses: focusing both on the material and/or semiotic mean, the modes, and the material communicational means, the media, seeing both necessarily in the context of the larger social and cultural, political and economic environment. This might enable the beginnings of working descriptively and analytically here—whether around social, communicational and/or semiotic categories such as authorship and authority, or epistemological categories such information and knowledge, or semiotic categories such as modes and their affordances, or pedagogic and/or psychological categories such as learning.

Description and analysis is one part of the task. Another, more important part, is the assessment of the social effects of these changes. And even more importantly for me is the question of my own role and my own responsibilities: Do I have a say? Do I have a responsibility not only to describe but also to propose? Do I have the right to oppose? Could I say that these forms that we had—to take a simple example, forms of syntactic complexity such as a complex sentence—are disappearing in this change? But these forms had real effects on what they provided for humans in their engagement with the world, their way of dealing with the world, in terms of conceptual and therefore intellectual power? Could I say that different forms of imagination are fostered and made possible—or some ruled out—by different configurations and uses of modes, and I think that we should strive to be conservatives in some instances and in some respects because these forms of imagination seem one valuable means of being human?

And can I say that depiction is a better means of dealing with much in the world than writing or speech could be? Could I say that the need to be forced into the automatic expression of temporality and causality in speech or writing is something that I not only do not wish but which may be a distortion of the way the world is? Could we have a better physics if image became more dominant? Would the next generation of children actually be much more attuned to truth through the specificity of depiction rather than the vagueness of word? And would it not be a better situation if we could all be authors of apt and accurate representations? And if we took our cue not from conventionally established authority but, equipped with the necessary aesthetic and ethical navigational aids, we were to establish authority and at times even knowledge for ourselves, would that not be a preferable position?

## **Acknowledgment**

I wish to thank Eve Bearn for permission to use the image that forms Figure 4, Visit to the British Museum.

## References

- Barthes, Roland. (1977). The death of the author. In *Image—music—text*. London: Fontana.
- Böck, Margit. (2002). Information, wissen und medialer wandel. *Medien Journal*, 27(1), 51–65.
- Böck, Margit. (2004). Family snaps: Life worlds and information habitus. *Journal of Visual Communication*, 3(3), 281–293.
- Jewitt, Carey. (2003). Computer-mediated learning: The multimodal construction of mathematical entities on screen. In Jewitt Carey & Gunther Kress (Eds.), *Multimodal literacy* (pp. 34–55). New York: Peter Lang.
- Kress, Gunther. (1989). *Linguistic processes in sociocultural practices*. Oxford: Oxford University Press.
- Kress, Gunther. (2003). *Literacy in the new media age*. London: Routledge.
- Kress, Gunther. (2004, March). Gains and losses: New forms of texts, knowledge, and learning. In *Session presented at the Conference on College Composition and Communication*.
- Kress, Gunther, & van Leeuwen, Theo. (1996). *Reading images: The grammar of graphic design*. London: Routledge.
- Kress, Gunther, & van Leeuwen, Theo. (2001). *Multimodal discourse: The modes and media of contemporary communication*. London: Edward Arnold.
- Moss, Gemma. (2001). Putting the text back into practice: Junior age non-fiction as objects of design. In Jewitt Carey & Gunther Kress (Eds.), *Multimodal literacy* (pp. 73–87). New York: Peter Lang.
- Sebald, W. G. (1998). *The rings of Saturn*. London: Vintage.
- Shannon, Claude, & Warren, Weaver. (1949). *The mathematical theory of communication*. Urbana, IL: University of Illinois Press.
- Simms, J. W. (1946). *The boy electrician*. London: Harrap.