

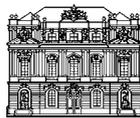
Michael Nentwich

# cyberscience

Research in the Age of the Internet

Chapter 5

## CYBERSCIENCE AND THE DISTRIBUTION OF ROLES IN ACADEMIA



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by Gunther Tichy, member of the Academy

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## 5 CYBERSCIENCE AND THE DISTRIBUTION OF ROLES IN ACADEMIA

The spreading of ICT technologies in academia and the related concentration of resources at the office desk lead to new requirements for those working in the research environment. Since these qualifications are partially too demanding to be fulfilled at all or at least sufficiently at the individuals' level, this may also impact on the distribution of roles in academia. Hence, traditional roles and scopes of functions may change. The result could be an accelerated shift of functions among existing players as well as the introduction of new players and new functions (Wellman/Minton 1998, 8).

For instance, the role of the librarian is in flux when the traditional library gives way to the digital library. New roles, such as specialised “information-brokers” may evolve with a view to manage online knowledge resources. At the extreme this might bring about a completely new division of labour in research between those gathering and preparing information and those working creatively (below 5.3). Furthermore, as scholarly work changes, new skills are needed: for instance, authoring for a digital environment or online information gathering is qualitatively different from the previous offline era (below 5.1). Cyberscience will also bring about changes for the scholars' role as teachers (below 5.2). Another area of change for both individual and institutional roles is publishing. The traditional distribution of tasks between the authors of academic texts and the publishing houses as well as between the latter and the university libraries (and agencies) are at stake due to the possibility of publishing electronically (below 5.4). Finally, the entire development may also have effects on the relationship between the individual members of the research communities – effects that are being discussed under the label of “democratisation” with regard to access to information and publication opportunities, in particular (below 5.5).

### 5.1 Scholars: new skills, new roles

“Scholarship plays three roles in our society. First, academia educates the next generation of professionals, managers, and leaders. Second, it makes formal knowledge available to society at large, stimulating the development of new products, informing debates on public policy, and improving understanding of our culture. Third, it develops new knowledge. Digital communication ought ultimately to be judged by how well it serves these three activities, teaching, service, and research.”  
(Getz 1997, 2)

Starting from Getz' observation in the introductory quote, I shall look at the role mentioned first in the next section (5.2), address some aspects related to the second role in 6.4.4.2, and start here with a discussion of the scholar's role as producer of new knowledge. Above all, the scholars' new working environment asks for computer literacy and what we may call Internet literacy. In our context here, “literacy” would not mean “expertise”, but rather “fluency”: except for those whose research actually involves program-

ming computers (such as some quantitatively oriented social scientists or high-energy physicists), academics do not have to understand all the details of their machinery, they do not have to write software code and construct databases etc. However, there is an increasing demand on them to become at least “experienced users” in order to work efficiently. Younger scholars, who have not known academia without computers, nowadays even see the networked PC as a standard tool, and mastering this tool a part of the identity of an academic. The following skills form part of these newly required competencies:

*Information seeking:* The capability to use online and offline databases as well as web search-engines effectively is paramount in cyberscience (Mueller 2000a, 2). The WWW definitely needs intelligent users since used unintelligently, it may be a waste of time, a source of misinformation, a huge distraction etc. (Thagard 1997b). In particular, databases need to be accessed in a professional manner, that is, by tapping the full potential of the query language. In many cases, this may mean to have to learn the “expert mode”. But it is more than just “using” it. Academics are knowledge workers dealing with gathering and re-combining bits of information with a view to generating new knowledge. However, finding the right information is only one side of the core business of academics. The other side is organising, structuring and evaluating the information space. Information brokering is the process of collecting and re-distributing information (Bressan/Lee 1997). Scholars are normally not in the business of selling the brokered information, but what they do on a daily basis is very similar. Just as academics were always involved in compiling encyclopaedias, student textbooks and state-of-the-art review articles, they will continue to do so in cyberspace as well. One potential lies in “a network of area-editors” (Ullman 1996) who would be charged with knowing, evaluating (perhaps with the help of referees) and creating a webpage pointing to the core on-line documents related to a particular subject. These scientific information ‘managers’ might perform the “highest function in the progress of knowledge” (Fröhlich 1996b, 11), that is, the integration of disconnected data into a coherent whole. For sure, top-level knowledge, including at the theoretical level, is indispensable to achieving this integration and contextualisation.

*Authors’ skills:* On a very basic level, authoring a book or academic paper seems independent of the medium, be it digital or print. Even at this level, mastering (collaborative) text editors, E-mail attachments, the various digital formats etc. already adds a new dimension. However, as I shall discuss in more depth in chapter 6, academic knowledge presentation is about to change in a profound way as the digital medium allows for the inclusion of multimedia (animated graphics, audio) and new forms of structuring (hypertexts, databases). Writing in the era of cyberspace will hence require “a new repertoire of skills – narrative, technical and pedagogical” (Armstrong/Lonsdale 1998, 25). Given the current development (see below 5.4.1), it is quite likely that authors will also have to do a large part of their own multimedia production in the future (Burg et al. 2000, 4). Writing in a digital environment, the author may become an ‘infopreneur’ “who owes more to the twelfth-century compiler-encyclopaedist than to the nineteenth-century genius-author” (Fuller 1998, 128).

*Designing paths through hyperbases:* If my hypothesis that hypertext databases may be the future of academic knowledge representation (cf. 6.2.2.1) holds true, then the process of “making” such databases consists not only in writing the individual knowledge units (modules), but also in designing paths “through” such a database, i.e. proposals for reading the database. While the authors of modules will certainly propose first paths, there may be authors of paths only. The latter fulfil a task equally important as the former. Whose role will it be? It may be the scholars’, the editors’, the cybrarians’ or perhaps

that of specialised journalists – depending on the addressee. In any case, there will be software to support this task. Hence I am not talking here about a purely technical matter, but of a novel intellectual task.

*Publishing:* Increasingly, the researcher is becoming his/her own publisher as both layout and publishing on the Web have become so easy (but also time-consuming, cf. 4.3.2.1). I shall come back to the dynamics in the publishing scene in later sections (5.4. and 9.1.3).

*New communication skills:* E-conferencing in whatever form not only requires technical, but also social skills, as fewer cues are available. Moderating a newsgroup or E-list is a completely new role for scholars. As we have seen in 4.2.2.2, this is all but an easy task and requires experience. Even simple participation by sending contributions to such lists (“postings”) is something that can hardly be compared with speaking out in face-to-face meetings because useful quoting and threading are required. The same is true for the usage of groupware and other advanced information sharing systems on the Web.

*Indexing:* As the evolving digital “docuverse”<sup>542</sup> needs structure and system to be useful, a number of initiatives have been launched to make it better accessible in cognitive (not only in technical) terms. The Semantic Web initiative (cf. 2.2.2.1) and similar endeavours aim at “tagging” web documents in a machine-readable form. It seems rather unlikely that providing the meta-information can be done centrally or even automatically. Hence, providing effective access in a networked environment could increasingly become the responsibility of the writer, probably with the assistance of local information services. It is likely that the indexing of the text becomes an integral part of the writing of the text (Atkinson 1993, 210). Again, there will be tools available to facilitate this, so it is not primarily a technical skill, but a new intellectual task, best performed by the scholars themselves. So far, only keywords are chosen among given lists. In the future, the semantic structure as well as the various connections to existing knowledge will have to be embedded.

*Secretarial tasks:* As the networked computer becomes ubiquitous in researchers’ offices, secretarial tasks are being increasingly performed by academics themselves. In particular, almost all correspondence, even if purely organisational, is done in E-mails by a large majority of all academics. Researching flight or train schedules for the next conference trips is now commonly done by academics, too. Copying of journal articles on the library’s copier is increasingly replaced by printing out files downloaded from the Internet etc.

#### NEW ROLES AND SKILLS FOR SCHOLARS

- Information brokering
- New author’s skills, including designing paths through hyperbases
- Self-publishing
- New communication skills
- Indexing
- Administrative self-management

#### Overview 5-1: New roles and skills for scholars

<sup>542</sup> This notion is mainly used by the hypertext community and denotes the entirety (or universe) of hypertext documents.

While most researchers would agree that the advent of the computer and the Internet has “changed their lives”, only few would readily acknowledge that their roles have changed, too. However, most of us have taken over secretarial, librarian or publishing tasks. In the future, a number of further, so far unheard of tasks will probably be the responsibility of scholars: digital information brokering, indexing and designing hyper-text paths. Together with the new skills needed for authoring and communicating in the digital age, these will add up to a far-reaching redefinition of what it means to work as an academic.

## 5.2 Researchers as teachers

“Experts assume that the new media will not primarily unburden the university teachers but will lead, in the longer run, to a changed distribution of roles in the process of teaching and learning.”  
(Hochschulrektorenkonferenz (BRD) 1996)<sup>543</sup>

Although research is the main focus of the study, we nevertheless need to look closer at the future of teaching in the age of cyberscience since giving seminars and lectures traditionally accounts for a considerable part of many researchers’ time (compare the dictum of “unity of research and teaching”). We have already looked into the future of the university structure as the traditional environment of most researchers (see 4.3.4.1) and found that important changes are in the making. Already today information technology plays an important role in distance-learning courses. It might be hypothesised that tele-learning, i.e. taking part in seminars and lectures without physical presence on the university’s premises, may increase its share and that there might eventually be virtual universities whose staff is dispersed all over the globe (Nicholson 1998). Furthermore, there are new opportunities given by networked multi-media course. Also grading systems and the teacher-student relationship are at stake. All this affects how teaching researchers cope with their two traditional roles. Thus, rather than discussing ICT applications in higher education in general (see e.g. McArthur/Lewis 1998) the guiding question of this chapter will be in what way the ongoing developments in teaching will change the environment for research. The following points are salient:

*Technical skills:* In addition to those tools which a scholar has to master in everyday research (see above), new technical skills are also required in the context of teaching in cyberspace (e.g. Abeles 1998, 607). Therefore, at least basic training in the effective use of this new medium will be required (Hearn/Scott 1998, 734). Software for supporting on-line teaching (cf. 2.4.8) often functions similar to groupware tools, but only few researchers already have some experience with these. Designing multimedia course material is yet another story. There will probably be researcher-teachers who would like to offer their students more sophisticated material and would hence have to invest more time in learning how to make it.

A special area where future teachers will have to build up competencies regards the evaluation of seminar papers and theses in the age of E-publishing. The wealth of in-

<sup>543</sup> Transl. MN.

formation available on the Internet allows students easy “cutting and pasting” (Armstrong/ Lonsdale 1998, 19). Teachers will have the new task of equipping themselves with and learning to handle the tools to discover this abuse.<sup>544</sup>

*Time-related aspects:* On the one hand, one would expect that the new media should lead to more time flexibility for university teachers. In particular, the asynchronous form of communication with students in E-lists or via bilateral E-mail allows for self-determined timing hence eliminating “the temporal rigidity of office hours or class meetings times” (Inayatullah 1998, 595). This may, but will not necessarily, lead to a 24-hours-per-day-7-days-per-week service. However, Twigg/Oblinger predicted that, by 2007, faculty will be forced to work at times and in circumstances when it is needed (on-demand) rather than on a fixed schedule such as the three-lectures-per-week model (1996). Furthermore, online course material can easily be reused and shared with colleagues and hence, saves faculty time. Much of the material needed is already ready-made and available over the Net.

On the other hand, preparing an online course takes more time than an offline one. Although, as discussed above, teachers will perhaps even share teaching modules and increasingly master the new software, online courses will probably not only be more costly as regards time in the beginning, but also later on. First, the Web is dynamic so that links to Internet resources have to be constantly checked and updated. There may be a silent pressure or expectation that teachers update course material even whilst the course is in progress (Hearn/Scott 1998, 733) just because it is possible in a digital environment. Second, while traditional handouts, scripts and excerpts from textbooks are rather simple, the expectations are rising in the age of multimedia. Designing good multimedia course material is definitely time-consuming and can be expensive.

The assessment whether ICT will lead to more or less faculty time is not univocal. Some argue that ICT are likely to increase rather than reduce the teaching load (Kirkup/ Jones 2000, 214). Others believe, by contrast, that IT may free faculty-student contact time for discussion (Massy/Zemsky 1995, 8). This leads to the question what the institution would do with the faculty hours freed up by capital-labour substitution. One option is to redirect them to departmental research. Whether this will be the case, however, is questionable, as it may not meet higher education’s economic needs (to cut costs).

*Role splitting:* In the era of ICT-based or -enhanced teaching and learning, teaching is not just lecturing; teaching involves many tasks at the same time. Therefore, some predict an “unbundling of faculty roles” (de Alva 1999, 58) that is separating teaching from content, development and assessment. The amount of codified knowledge captured in courseware is increasing. As a consequence, the role of the faculty member becomes increasingly that of “mentor or leader in the learning process” (Twigg/Oblinger 1996). Furthermore, a “differentiation” of the faculty role or a “desegregation” of the various roles previously combined in a single faculty member may result. Twigg/Oblinger, for instance, distinguish four roles (developers of courses and courseware; presenters of that material; expert assessors of learning and competencies; advisers).<sup>545</sup> At the extreme, Skolnik even predicts that “faculty work will be broken down into specialised tasks which could be done on a repetitive basis, like work in an automated factory” (1998, 647).

<sup>544</sup> Cf. the examples of student seminar-sharing sites at the end of 2.4.8 and the first tools available.

<sup>545</sup> Nicholson (1998, 728) lists three distinct functions: admission/assessment specialist; courseware author; and online facilitator.

On a macro-level, the traditional roles of academics may be split organisationally with a few “academic superstars” (Abeles 1998, 611f.), and a majority of faculty becoming mentors and guides to students. An extreme vision would be that the superstars would record the “ultimate” lecture for each topic, which will then be sold and consumed everywhere. The status of the rest of the teachers would turn into that of a ‘colleague and guide’. This would require them to give up power and status (Kirkup/Jones 2000, 215). If the scenario holds that tele-teaching courseware will be marketed between universities (cf. 4.3.4.1), then the demand of each university for a specialist (teacher) for each and every subject is reduced (Glantz 1998, 17). Eventually, there will be fewer posts for university teachers, and hence, part-time researchers (as teaching and research is often combined). However, this tendency may be partly outweighed by the following:

*Pedagogical skills – from teacher to tutor:* Lecturing in a traditional sense, that is a one and a half hour talk in front of the class, will probably further lose in importance. Such lectures could easily be recorded (audio and/or video together with presentation slides) and reused. Basic information and concepts may easily be offered online via CD-ROM or E-text books or homepages. There is, however, the chance that educational quality could be improved as this leaves faculty more time for in-depth discussion and tutoring (Massy/Zemsky 1995, 8; Noam 1995). It seems rather unlikely that E-teaching programs will ever fully substitute human interaction (Massy/Zemsky 1995, 4).

#### RESEARCHER AS TEACHERS

- New technical skills needed
- Time gains and losses
- Role splitting: teacher superstars
- From teacher to tutor

#### *Overview 5-2: Researcher as teachers*

For sure, there will be considerable differences from university to university, from department to department, but if the hypothesis holds true that we are at the brink of an evolution towards a world-wide education market (cf. 4.3.4.1), the role of researchers as teachers will change profoundly. Either they would have to master a number of new and challenging techniques as the students’ expectations rise, or an even more visible split between teachers and researchers as well as among those involved in teaching will see the light of day. The role of university teacher is about to be redefined and differentiated. One vision goes as follows: There might be a number of lecturers in each field known world-wide for their outstanding performance in a few standardised basic courses, a number of course material authors mastering the art of multimedia presentation, and many tutors specialising in ICT-enhanced individual and group teaching.

## 5.3 From librarian to cybrarian

“Technology will solve the librarians’ problem, but will also eliminate most of their jobs. Just like publishers, libraries will have to shrink and change their role.”

(Odlyzko 1994, 49)

“Does a digital library have librarians? If so, what do they do?”

(Harter 1996b, 5)

The loss of importance of traditional publications and the increase in electronic information resources in research triggers a shift of roles for academic librarians.<sup>546</sup> Many claim that by the emergence of ICT the core mission of the library is significantly affected (e.g. Kresh 2000; Johnston 1998, 7).

Libraries perform an intermediary function between publishers and other information producers, on the one hand, and end-users, on the other. They are both clearinghouses and selective (quality) filters. The services of librarians are carried out according to the so-called “4S-scheme”: selection, storage, service and support (Owen 1997). All four “S” are affected in the age of cyberscience. Librarians’ main function is seen to move from being keepers of collections to becoming finders, organisers and suppliers of networked services for digital information resources (Walsh/Roselle 1999, 70; Owen 1997). The role of the library will be redefined in terms of knowledge mediation. As opposed to the traditional intermediary role between publishers and users, the new intermediary role will be in matching “user needs to available knowledge contained in information resources, irrespective of where and in what form these resources are available” (Owen 1997). Academic libraries have already lost some of their “constituency” since academics, in the digital age, may easily satisfy their needs outside their home institution’s library (Odlyzko 1994). We may speak of a new “division of order” (Owen 2000, 6) in the academic world because researchers and research institutions will be in far greater control of everything having to do with information than libraries are used to at present.<sup>547</sup>

In the following, I shall look at the transformed old and the new tasks constituting the new role of the “cybrarian” (e.g. Okerson 1997b; Johnston 1998), that is the librarian in cyberspace:

*Preservation of paper stock:* To begin with a traditional task that will survive in the foreseeable future, cybrarians will still take responsibility to preserve all the paper material already in the library. I expect that the amount of paper flowing into the library will slowly diminish, but perhaps never reach a zero level, at least not in all kinds of libraries. However, even this well-known role will be somewhat altered as there are digital publications with a physical substrate, such as CD-ROMs or books on diskettes that need to be stored like books. In addition, preservation may also mean the conversion of paper to digital formats, in particular as less expensive paper will not survive for too long. This latter task will, however, not be carried out at the level of smaller individual libraries, but organised centrally, just like archiving.

*Archiving the digital stock:* In the presence of an ever-growing amount of digital publications, E-archiving involves the “need for the library professional who possesses both

<sup>546</sup> Although we may assume that public libraries will undergo a similar process of change, I focus here on academic libraries only.

<sup>547</sup> The CSU-SUNY-CUNY Joint Committee (1997) presents a number of telling scenarios in which the librarian of the future plays an important and different role within the university.

the traditional library skills and a clear understanding of and facility with emerging technologies” (Dementi 1998, 3). New procedures for selecting and cataloging will be required (CSU-SUNY-CUNY Joint Committee 1997, 5) and probably be one of the main tasks of cybrarians. This is, furthermore, particularly important as there is not only “official” digital data. Many individual faculty members, laboratories and departments are investing substantial sums on information, creating resources which are essentially private libraries, “with no standards for the organization and archiving of data, no strategy for the preservation of data as the technology evolves, and no public access” (Chodorow 1998, 5). The cybrarians may be advisors and experts for archiving that “in-official” digital information, too.<sup>548</sup>

*Computer experts:* It is very likely that computers will be the most important part of tomorrow’s library infrastructure. Cybrarians already closely co-operate with computer departments in order to secure hard- and software access to the virtual information space. This co-operation will further intensify as the importance of the digital resources increases. It might well be, however, that cybrarians become computer experts themselves. To name just one example mentioned by Hockey (1997b, 4), “getting information out of a relational database for use by other programs usually requires some programming knowledge”. This makes cybrarians more expensive. From the example of project Muse providing access to a great number of E-journals in the humanities<sup>549</sup>, we learn that the staff cost about 20% more per capita per month than the staff of print journals (Regier 1997, 5). Hence, important investments in staff development will be required (CSU-SUNY-CUNY Joint Committee 1997, 14ff.)

The relationship between the library EDP (electronic data processing) unit and the university’s general computer department may be redefined, given the rising importance of the former. Over recent years, most general computer centres have developed from providing the technological infrastructure of the sciences and quantitative social sciences to an information system of the university “creating, giving access to, and acting as a repository for databases” (Chodorow 1998, 5). However, when it comes to the provision of information and not of a technical infrastructure, cybrarians might be better placed to provide the service. While it seems that librarians are not eager to become computer centre managers, “they understand that if they only license access to information that is owned by a publisher then their role as librarian is diminished” (Franks 1993, part III). Franks concludes that for a library to own electronic materials it would have to archive them. “This in turn requires computing facilities and new expertise.”

*Providing access to E-documents:* In the era of cyberscience, distance access will become more important than direct access of local documents. As a consequence, the status of a library “will depend on the quality of its services and support rather than on the volume and quality of its physical collection.” (Owen 1997) This includes not only access to E-journals and other digital publications but also to other resources, such as websites etc.

*Structuring the info space:* As most of the resources available on the Internet are unstructured, cybrarians will have ample work to facilitate information access – not only from a technical point of view but in particular as regards content. As Atkinson puts it: “Online selection as an information service is (...) an act of appending to the text some evaluation of it, and this literally ‘added value’ is the indispensable service that will make

<sup>548</sup> On digital archiving in general, see 2.5 for the technical side, and 7.3.3 for the organisational and content-related questions.

<sup>549</sup> <Cyberlink=380>.

possible networked scholarly communication.” (1993, 205f.) Four important areas of activity can be distinguished:

(1) *Trusted link collections, access points, search engines, portals*: It is difficult for the (inexperienced) information seeker to realise which information is reliable and which is not, i.e. whether the beautiful logo on top of the homepage belongs to a serious information provider. Cybrarians may contribute by providing for link collections or by giving advice in individual cases. This will require a good deal of “market” research beforehand to build up the necessary knowledge. Good and reliable link collections for special fields will probably be edited together with scholars (cf. 7.2.4.1). The subject-orientated guides to web resources have to be critically assessed (Johnston 1998, 16) to make them useful to academics who want to rely on them for their work. Configuring specialised search-engines may be another route to provide better access to the wealth of digital information (cf. 2.3.5). Helping to create archives for special collections of E-documents, such as research reports or working papers, is one further prospective activity of cybrarians (e.g. Brüggemann-Klein 1995, 173).

(2) *Enhancing reliability of addresses*: It is often difficult to trace down electronic documents since their URLs may change easily (cf. 2.1.2). Cybrarians are well positioned to contribute to a lasting solution as they are at the interface between users and publishers, commercial or others, and may help to co-ordinate the various initiatives. In this context, cybrarians may be engaged in what has been called “networked information resource discovery systems” (Owen 1997), that is the locating of digital items in the network.

(3) *Subject indexing*: On the path to the Semantic Web, it will be necessary to extract or insert “meta-data” in E-documents: abstracts, authors, publication dates, versions, keywords etc. have to be computer readable (cf. 2.2.2.1). Subject analysis will be very important. Much standardisation is required in order to make machine-searches as reliable and efficient as possible – and this again requires much co-ordination work done: one of the groups who will certainly have a stake and will be participating in these activities are again the cybrarians. It is to be expected that this new role is a continuous process, constantly adapting to changing technical developments and, hence, leaving much work to be done for a longer period.

(4) *Standardisation of document structure and access protocols*: In case the scholarly publication system develops into a (hypertexted) online information environment (see 6.2.2.1), then there will be a need for (international) standardisation, for defining the structure for all formal scholarly writing. This could be the task of the cybrarians (Atkinson 1993, 211). In the model of the “control zone” (Atkinson 1996, 261) as the universal, digital virtual library (cf. also sections 9.1.3.3 and 8.2.3), everything in there “needs to be presented and accessed according to the same protocols”. This project would not be realised centrally, but there would be decentralised efforts (e.g. the responsibility of each institution to mount the publications of its own faculty), and some sort of “regionalism”<sup>550</sup>. Hence, there is a need for standardisation of the interfaces between the different regions in this universal digital library to guarantee interoperability.

*Publishing*: A fifth item may be added to the four “S”s, a “P”, namely publication (Owen 1997).<sup>551</sup> As we shall see in a later section (9.1.3), commercial publishers will not

<sup>550</sup> Because, in Atkinson’s opinion, a large publishing industry will remain in the online environment for the higher-use materials and there will be differentiation due to varying capabilities and budgetary restrictions of institutions.

<sup>551</sup> Similar Atkinson (2000), although referring to a much changed environment.

necessarily be dominate publishing in the digital world. Libraries are already engaged in storing digital files of all sorts. In those universities where there is no own university press, it seems plausible that doctoral or master theses, working papers and E-journals reside on the libraries' servers (cf. 5.4 below).

*Teaching:* In the next sub-section, I shall analyse the cybrarians' future role in information brokering and counselling. This will involve close contact with scholars and students. Hence, it will only be a small step towards teaching. Perhaps, the role of the librarian is becoming "more like that of classroom faculty, in that it is increasingly discipline-based and instructional" (CSU-SUNY-CUNY Joint Committee 1997, 5). This evolving role of cybrarians will include teaching students and faculty how to access information, whatever its format or location, and how to evaluate what they find (cf. also Bazin 1996).

As *information brokering* will be at the heart of the librarians' new role description, I shall discuss this in a separate sub-section (see immediately below).

#### ROLES OF CYBRARIANS

- Preservation of paper stock
- Archiving the digital stock
- Computer experts
- Providing access to E-documents
- Structuring the info-space:
  - Trusted link collections, access points, search engines, portals
  - Enhancing reliability of addresses
  - Subject indexing
  - Standardisation of document structure and access protocols
- Publishing
- Teaching
- Information brokering

*Overview 5-3: Roles of cybrarians*

### 5.3.1 Information brokering, consultancy, information management

"[Librarians] traditionally interpose [themselves] between the user and the information. And now, just when it appears that technology will finally liberate the user from the tyranny of mediation, the library, in its new guise as information service provider, appears poised to insert itself once again between the information seeker and the information sought." (Atkinson 1993, 211)

Beyond professionals providing structured access to virtual information, the age of cyberscience needs experts for searching, retrieving and working up the information. As Mueller (2000a) puts it, "the abundance of bibliographical resources now calls for new skills of pruning and screening". This task is of particular significance in academic research since the worldwide Net is not hierarchically structured but somewhat "chaotic" and de-

centralised and, in particular, dynamic. Here I use the term ‘information brokers’ for those who assist scholars in finding, ordering and managing online knowledge resources (e.g. Stichweh 1989, 52) – possibly with the help of “bibliomining” techniques and know-bots (cf. 2.2.2.2 and 2.2.2.3).

A separate group of (new) actors may evolve, just between the cybrarians and the researchers because these investigations are time-consuming and often require more specialised knowledge which cybrarians do not have, since they look after a wide range of subjects on a more general level. Bowman (1999) describes this “scientific information manager” as someone who “could play a decisive role in ensuring the discipline specific quality, the added value and most efficient use of the innumerable new opportunities now becoming available to the international research community”. Hartmann (2002, 264) predicts that there may be “rating agencies” to assess the quality of knowledge.

Alternatively, the researchers themselves may become their own information seekers (see already above in 5.1). Researching resources and information gathering is an important part of research itself. The more the resources migrate to the virtual world, the more knowledge and particular expertise accumulates with the researchers. It is, however, likely that a few will specialise and provide the job for others (scholarly information brokers). For instance, Denning (1996) reports that a scholarly/professional association, the Association of Computing Machinery (ACM), provides brokerage services for its members. Also writing for the novel review journals, which give direct and structured access to the state-of-the-art of a sub-discipline, may be a way (cf. 7.3.1.4). Odlyzko even predicts that “(w)ith immediate electronic access to all the information in a field, with navigating tools, reviews, and other aids, a few dozen librarians and scholars at review journals might be able to substitute for a thousand reference librarians” (1994, 50).

However, the cybrarians may nevertheless be the most likely candidates. The cybrarian will have to accept the writer “as a client deserving of a level of service at least equal to that of the reader” (Atkinson 1993, 209). One argument in favour of this alternative is that classifying and assigning resources as regards contents has always been one of the prime tasks of librarians. Furthermore, cybrarians will be deeply involved in the business of the administration of the electronic resources (see above 5.3) and hence acquire the necessary experience. In this sense, the librarians are seen as “indispensable counselors in the electronic environment” and “advisors and teachers rather than as custodians of collections” (CSU-SUNY-CUNY Joint Committee 1997, 5). Libraries would become “clearing houses of information” rather than “museum-like retreats” (Hauffe 1996, 146) and, perhaps, the work of cybrarians in the future would even be “to define the discipline and its parameters (including the creation of such synoptic resources as textbooks)” (Atkinson 2000, 68).

To be able to fulfil this important role, libraries, EDP departments and computer science institutes will have to co-operate more closely and co-ordinate their activities (Brüggemann-Klein 1995, 175). Also external co-operation between libraries seems helpful. There are already examples of cybrarians doing exactly this. Under the label of “collaborative digital reference services on the web” (Kresh 2000) many libraries all over the world (but with strong focus on the USA) collaborate by exchanging and answering queries to the reference desk and storing answers in a knowledge base. Kresh also describes a Library of Congress led initiative pooling the information brokering activities of libraries world-wide, whereby cybrarians would be linked together through the Net, a database and request manager software.

To sum up, it is unlikely that there will be an explicit division of labour among the academic personnel into “information brokers” and “thinkers”/“creative people”.<sup>552</sup> Cybrarians will play a key role when it comes to providing the necessary services of academic information brokering and consultancy. In some respects the scholars themselves will do similar things and the cybrarians, either as part of an institution (physical or virtual) or working independently, will support them. In any case, good “information management” will be a key asset in the future of academia. The research institution mastering this challenge, i.e. filtering in due time the necessary, relevant and reliable data out of the information flow of the Internet, may finally achieve better results. This requires a well structured co-operation rather than a division of labour plus the right tools. While in the beginning, ICT “seemed to reinforce divisions between (...) those who managed and administered and those who engaged in academic work” (Pollock/Cornford 2000), strong co-operation between academics, cybrarians and computer experts will be important. While the activities of the librarians and the researchers have been quite distinct until recently, they are becoming more and more congruent under cyberscience conditions. As the pure management of the stock becomes less important, both groups gather and systematise information and try to separate less relevant items from more relevant ones and both do it in the same medium meanwhile.

## 5.4 Role dynamics in the publishing sector

“The ongoing discussion in the academic community is not only a dialogue about the practical issues of how electronic publishing affects the scholarly communication process, but a process in which all members of the scholarly, library, and publishing communities are being forced to reexamine – and in some cases redefine – their roles in that process.”  
(Dementi 1998, 1)

The academic publishing sector is in a state of flux. Some speak of a “mixing of roles and the increasing appropriation of functions by the various actors” (Owen 2000, 3; similarly Frisch 1996, 370f.). There are changing and new markets and changing boundaries between the different players and, in particular, a convergence of the media content people with the technologists (Oakley et al. 1997). Hence, two main reasons can be detected, an economic and a technical one. On the economic side, the so-called serials crisis in the sciences and the book crisis in the humanities (cf. 9.1.3.2) led to considerable strain on the traditional system. On the technical side, the advent of E-publishing opened up new opportunities (cf. chapter 7). In 9.1.3, I shall explore the hypothesis that the current development might eventually lead to a de-commodified<sup>553</sup> system of academic publishing, that is a much more limited role of commercial publishers. Here, I discuss the changing roles of academic authors, commercial publishers, university presses, agencies and libraries in general. Two main issues are noteworthy: the phenomenon of outsourcing of publishing tasks (5.4.1) and the slow re-definition of institutional roles (5.4.2).

<sup>552</sup> The hypothesis would be that the first would do the groundwork for the latter by making sure that the flow of information does not dry up and is available on demand in a structured way; the latter would process the information, analyse, build hypotheses, test and underpin them theoretically.

<sup>553</sup> De-commodification means de-commercialisation of the academic publishing sector; see below 9.1.3.4.

### 5.4.1 The age of outsourcing

Due to the considerably increased capacities of desktop word processors, publishers have long since<sup>554</sup> transferred a number of editing and typesetting functions to the author (Owen 2000, 3; Mueller 2000b, 2). For instance,<sup>555</sup> secretaries and/or scholars are in the business of layout. They have to submit electronic texts according to the ‘house style’ of the publisher. In some case even camera-ready manuscripts with half title and indices etc. have to be delivered. This tendency will probably be intensified in the age of E-publications since here only electronic submissions are accepted. First experiences with pre-publication series and E-journals show that even submission in PDF or HTML formats is sometimes required. Furthermore, copy-editing, that is the verification of quotes, the control of consistency as regards contents and often language editing has to be paid and organised by authors. Also marketing is partly outsourced to authors as they have to transmit addresses of potential buyers and have to send out folders themselves etc. (see Grötschel/Lügger 1996, 4) whereas the publishers often do not do more than listing the book in their catalogues. Today, most scholarly authors in most disciplines “are effectively their own typesetters” (Mueller 2000a, 3; Riehm 1990b; 1990a).

This leads to a creeping change of role distribution: a traditional role of the publishing houses, i.e. the technical handling of texts, has been outsourced, not to free-lancers, but to academia (in particular, but by far not exclusively, to their secretaries<sup>556</sup>). Furthermore, commercial publishers also outsource most of their other business, such as printing, copy-editing, marketing, now also web-design etc. to free-lancers or other specialised firms, often at the other end of the world. Consequently, there will be fewer in-house jobs in publishing houses. This trend is being reinforced by the technological revolution, in particular the possibility to telework. Editors have to master the new communication technologies (Shipton 1996). Already by 1996, there had been a commitment to achieve 100 per cent on-screen copy editing (Dresskell 1996).

In sum, editorial costs are pushed to the author (Mueller 2000a, 4). This means that “the work is now done not by a medium-skilled typesetter but by a highly-trained, highly-paid academic, the system-wide costs have undoubtedly been increased” (Day 1998, 3).<sup>557</sup>

### 5.4.2 Slow re-definition of institutional roles

While those who have always been involved in academic publishing remain players in the age of cyberscience, too, their role descriptions change. The following list has the purpose of pulling together the arguments made both in this chapter and in 9.1.3 on de-commodification:

- The *research community* has not only taken over some of the traditional tasks of publishers (see above 5.4.1) but it has become a publisher itself (as already mentioned in 5.1). This takes various forms: self-publishing on homepages, uploading of pre-prints, running E-journals etc. (see below 9.1.3.3, ad (4) for an overview).

<sup>554</sup> Riehm (1988, 24) reports that back in 1987 only 15% of German authors used computers for editing manuscripts.

<sup>555</sup> Cf. also 9.1.3.4.

<sup>556</sup> Today, richer academic institutions often have their own desktop publishing departments.

<sup>557</sup> See also Rost (1996a, 211); Grötschel (1996, 5); and Sietmann (1999, 230).

- *University presses* may again rise in importance with a view to solving the serials and book crisis (cf. 9.1.3.3).
- *Academic libraries* are well placed to act as institutional digital publishers (see above 5.3) since they are about to acquire in-depth knowledge of the organisational and technical issues involved (Owen 1997). The various initiatives and proposals are discussed in 9.1.3.3.
- *Scholarly associations* may play an important role in the future digital publishing scene. Many of them have already acted as publishers, others may follow. Their core role will be editing and quality control (see 9.1.3.3).
- *Ad hoc organisations* may also play a role in publishing. Wellman/Minton (1998, 8) report an instance where a non-profit body was organised solely to produce a new on-line journal, namely the AI Access Foundation to produce the Journal of Artificial Intelligence Research.
- While some *commercial publishers* reproach the scholars for taking over the publishers' role while being backed by state subsidies (Grötschel/Lügger 1996, 4), most see the digital world less as a threat to their business than as promising new markets/opportunities. Whether they will take over this emerging market completely or whether they may have to content themselves with a few remaining niches, will be discussed in 9.1.3.4.

Publishers are also taking up some traditional functions of libraries (Odlyzko 1999; Sietmann 1999, 228), in particular “cataloguing & indexing, short-term archiving, and end-user services such as document delivery” (Owen 2000, 3). While it was traditionally the task of librarians to organise structured access to publications, today there is often a parallel route of delivery of these services as some of the commercial publishers have become so big that they are in a position of offering a great variety of products “in-house”. With the WWW as a convenient delivery interface, they do not necessarily have to use an intermediary, such as a library, or an agency (see below Oechtering 1996, 409).

- *Agencies* mediate between libraries and publishers. Not all publishers are willing to let agencies handle E-journal subscriptions since they seem to want more control over their E-journals (Göttker 1999). The libraries, too, may want to keep their position as pooling institutions for publications also in the digital age. Hence, one possible outcome of the current development may well be that agencies will disappear as their functions have been taken over by either the publishers or the libraries themselves.<sup>558</sup> However, because of economies of scale in managing access to electronic services, electronic agents are likely to play an important role nonetheless (Getz 1997, 15). First, the “electronic agents” may be ideally placed for storage of the electronic data because there would be a trend towards a more centralised storage of E-journals. The agent “may acquire rights from publishers and sell access to libraries, while taking responsibility for an optimal choice of storage sites and network access” (ibid.). The storage might end up “in a low cost location with the electronic agent responsible for archiving the material and migrating the digital files to future hardware and software environments” (ibid., 17). Second, the agent is able to integrate the journals into databases,

<sup>558</sup> A telling example of how librarians are somehow acting as agents is the comprehensive list of E-journals by the University Library of Regensburg/Germany (<[Cyberlink=162](#)>). Its very informative traffic-light system – symbolising for each journal its availability to the current user – can be individualised for all participating libraries.

offering a significant core of the literature in a discipline and, eventually, the standard database in a discipline. As the ultimate model, the database might include hot-links from citations in one essay to other elements of the database (*ibid.*, 18).<sup>559</sup> Getz who is not an agent himself but a professor of economics comes to the conclusion that the agents for E-publications would be in a position to offer “advantages of scale in managing electronic storage, optimize the use of networks for distribution, offer superior search interfaces and engines, and take steps to integrate materials from disparate sources into a coherent whole” (*ibid.*, 20). Given the latest forceful activities of both the publishers and the libraries (see above), Getz seems to have been proven wrong already.

In sum, the traditional role distribution, that is, the traditional information chain from author to publisher to library to user (Owen 2000, 6-7), gives way to a new model of dissemination of knowledge (from author to user, with some interference from publishers and libraries). As the product is increasingly made by the author him/herself, the roles of publishers and libraries transform from product-orientation towards service-orientation. Notwithstanding the possibility of a de-commodified system of scholarly publication (as discussed in 9.1.3), the roles are changing: new actors appear (scholars, ad hoc organisations), others regain importance (scholarly associations, university presses), others may even disappear (agents) and still others must redefine their position altogether (libraries, publishers).

## 5.5 The changing role of academic computer departments

Most research institutes have no own computer department. Often it is one of the researchers who is co-responsible for running the PCs and helping out his/her colleagues. The central departments are responsible for infrastructure management, in particular the networks, and, to a limited degree, user support. In this situation, most users (that is researchers, librarians, administrative staff) have to become their own computer experts (*cf.* 5.1 and 5.3).

Given the enormous speed in which new software is being developed and implemented, this is a huge task not leaving much time for in-depth study of handbooks, exploration of new tools and ways of doing research. This could be an area where computer departments specialise in the future. Apart from keeping the infrastructure running, shielding it from fraud and avoiding loss of data, developing specific applications for academics, seeking out new solutions and optimising computer use may be promising tasks. Often academics only know the absolute minimum of functions, they “drive on three cylinders only”. Computer use is often inefficient. Computer departments would be well positioned to help with data handling, visualisation, multimedia, video-conferencing, generating templates, writing little scripts (“macros”) and testing and implementing new tools. Academics mostly do not know what is available and what could be automated.

While some of these functions need decentral, local support, others can be taken over by centralised institutions in large research conglomerates. The Max Planck Society, for

<sup>559</sup> Note that the initiative of commercial publishers, CROSSREF, is just envisaging this (<Cyberlink=376>).

instance, founded the Heinz Nixdorf Center for Information Management (ZIM)<sup>560</sup> in 2001 serving the Max Planck Society and its scientists as a competence and innovation centre for information management in basic research. Its activity areas are in information provision, electronic publishing and information management in the research process. Major current projects are a society-wide virtual library<sup>561</sup>, an E-document server<sup>562</sup> and the back-office software for the innovative Living Reviews project<sup>563</sup>.

## 5.6 Democratisation? Status and hierarchy in cyberscience

The migration of scientific communication into cyberspace or at least the establishment of parallel structures in the virtual arena may have consequences with respect to the hierarchical status structures in academia, too. I have already analysed one aspect under the heading of “peripherality effects”. In chapter 4 on the spatial dimension (4.3.4.3) I discussed whether one of the effects of CMC might be digital unity on a macro level. A related, but distinct aspect is its impact on the micro level of individual researchers, in particular on “peripheral scientists” – defined as “those less senior, less eminent or not located in major institutions” (Walsh/Roselle 1999, 61). The hypothesis to be discussed is that the new opportunities of communication and information access through ICT may possibly lead to a sort of “democratisation” of academia, that is, a “level playing field” for both the peripheral and the central researchers. Fröhlich speaks of the “potential of democratisation” of disciplinary information systems and computer networks and defines “democratisation” in our context as

“the moderation of the Matthew effect<sup>564</sup>, the encouragement of transitive scientific critique beyond closed ‘invisible communities’ with their exclusive information distribution, ‘citation cartels’ and courtesy reviews, the reduction of inequalities in the access to academic resources, and the dissemination of academic works according to quality criteria and not according to the recognition of the name of the author” (1993, 7, transl. MN).

I will discuss the issue in three steps. First, I shall look at the arguments in favour of the hypothesis, second at the doubts raised and finally at the empirical evidence gathered so far.

<sup>560</sup> <Cyberlink=810>.

<sup>561</sup> <Cyberlink=802>.

<sup>562</sup> <Cyberlink=804>.

<sup>563</sup> <Cyberlink=907>.

<sup>564</sup> “Those who have, will be given.” See below 5.6.2.

### 5.6.1 The case in favour of democratisation

The various theoretical arguments in favour of the democratisation thesis can be summarised in the following groups:

(1) ICT allow *easier access to invisible colleges*. Lower-level individuals are less constraint in contacting higher-level individuals (Sproull/Kiesler 1986, quoted by Walsh/Roselle 1999, 65).<sup>565</sup> Such contacts may allow scientists who previously lacked the access needed to stay up-to-date and to become active participants and perhaps future core members of their specialities (Walsh/Roselle 1999, 65). As now “anyone anywhere can join discussion lists or computer conferences or look at bulletin boards” (Rowland 1994), more academics are admitted to the invisible college, in particular (under)graduate students (Finholt/Olson 1997, 35).

(2) CMC provides *less status cues* than face-to-face communication, in particular as regards rank and gender (cf. 4.2.3). The in many respects less formal Internet culture seems to favour informal contacts bypassing the established/standard top-down procedures. In particular with regard to discussions in E-lists, it seems to be of lesser importance who the author of a message is, as long as it is a convincing contribution to the overall discussion. This effect is also visible as regards bibliographic databases where “the most famous and the most marginal documents are retrievable on the same plane of accessibility” (Geser 1996, 10).

(3) Access to *publication opportunities* is eased due to the fact that it has become easier to publish electronically. Although less visible for the core researchers than formal paper publication, self-publishing offers peripheral researchers a stage. In particular, open-peer review and no-peer review (as regards E-prints; cf. 8.2) may lead to diminishing importance of higher ranking academics since their opinion may (at least partially) be replaced by the collective assessment of many.

(4) *Timely access to (scarce) information* is an important factor in establishing and maintaining hierarchies. By establishing parallel channels, computer networks may have the effect that it is much harder to withhold information. In the era of print journals, the scarce copies were often not circulated quickly among all faculty but stayed on the desks of the highest-ranking. Now, the latest issues of journals can be accessed directly by anyone at the same time. Also access to computer facilities, software and databases is distributed more equally (Finholt/Olson 1997, 35). A typical example is the so-called “ome” databases in molecular biology (cf. 3.2.3.2) which allow, in principle, access to everyone worldwide. This increasingly separates the production of raw data from their analysis and has a democratising effect.<sup>566</sup>

(5) In extreme cases, *dependencies might even evolve the other way round*: professors are rather latecomers in CMC<sup>567</sup> as compared to younger scholars<sup>568</sup>. Often, the formers are dependent on the computer and Internet skills of their younger assistants and collaborators. This advantage of the younger may eventually be durable because of the in-

<sup>565</sup> Orthmann/Näcke (1999) are even rather optimistic with regard to the potential of academic online chatting in this respect. A bright future of chatting in academia seems, however, not likely in short or medium term, as there is practically no empirical evidence for any academic use of chatting, yet (cf. 3.3).

<sup>566</sup> Note, however, that access to these databases is not guaranteed if the data have been produced in a commercial setting (cf. 11.2.1.3).

<sup>567</sup> They are “cyber immigrants”, as Barlow calls them, quoted by Abeles (1998, 610).

<sup>568</sup> The “screenagers”, as Rushkoff calls them, quoted by Abeles (1998, 610).

herent dynamics of the technological developments. Furthermore, younger members of academia seem more prepared to share information and to be active in the virtual environment. Consequently, some information may even circulate earlier electronically and serve the ‘screenagers’ first (cf. Barley 1990, quoted by Walsh/Roselle 1999, 61).

(6) The new technologies not only support the productivity and effectiveness of discourse, but are also said to have the potential to further discourse since the technology itself takes over discursive functions. Some argue that more discourse automatically democratises the powers of “the old information elite” (Rost 1998c) and that “collaboratories may become the home for scientists who are marginalized in their larger, more traditional scientific communities” (Finholt/Olson 1997, 35).

Rost goes one step further and claims that computer networks like the Internet are at the last phase of the industrial revolution (1998d, 6; also Rost 1996c). He argues that, so far, scholars were like artisans who would not like to collaborate much and would work like individualistic geniuses and be rather techno-phobic. Furthermore, they would lay claim to their rights of authorship and cherish the individual attribution of academic products to specific authors. Rost would like to see, by contrast, the present traditional “guild-like structure” of the academy vanish and become democratic. In the Internet environment, he notes, it would no longer be possible to set up “closed shops”. They would have to prove their functionality and legitimacy, because the technology allows for alternative forums to be constructed easily. These two developments, industrialisation and democratisation, would together create what Rost calls the “scientific society” (1998d, 8). Rost’s argument is summarised in the following table:

*Table 5-1: Academia and communication medium*

<b>Academia and paper media</b>	<b>Academia and computer networks</b>
Guild-like social structure	Industrialisation/democratisation of the academic system
Primitive production, circulation and consumption technologies	Technically assisted discourse (teamwork, selection through machines and discourse, groupware)
Scholars as non-collaborative, techno-phobic artisans	Scholars as information workers

*Source: Based on Figure 4 in Rost (1998d, 7, transl. MN)*

While there is certainly some truth in Rost’s analysis, it is obviously full of normative claims and wishful thinking. In the following sections, I will assess whether these claims stand up reality.

### 5.6.2 The Matthew effect in contrast to democratisation

“For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath.”  
(Matthew 25:29)<sup>569</sup>

Merton (1968, (446)) describes the Matthew effect as consisting “of the accruing of greater increments of recognition for particular scientific contributions to scientists of considerable repute and the withholding of such recognition from scientists who have not yet made their mark”. Will this “misallocation of credit” (ibid.) terminate in the age of cyberscience? Or might there be “rather a reinforcement than a weakening of the Matthew effect” since “the networks are primarily used frequently and successfully by persons who already have personal relations to other researchers” (Fröhlich 1996b, 10)? Those who are in command of social or symbolic capital, such as face-to-face relationships at conferences, invisible communities, citation cartels etc. may be given even more, such as rapid and economical use, intensification of these relationships through electronic connections over any given geographic distance.

In the literature, the following arguments *against* the democratisation argument are discussed:

(1) One trend is that *status distinctions are reproduced* in CMC as the technology becomes more developed. Improvements over the crude E-mail technologies of the early Internet years include more decipherable E-mail addresses (OECD 1998, 198); pictures and biographies on personal and institutional homepages; and video chatting instead of pure-text-communication. One could also argue that to the extent that such technology is incompatible with existing status distinctions (or to the extent that it does not support making them visible) CMC would not be used (Walsh/Roselle 1999, 61).

(2) *Scarcity of time*: Not yet in a position to talk about the Internet, Merton nevertheless already stated in 1968:

“There is reason to assume that the communication function of the Matthew effect is increasing in frequency and intensity with the exponential increase in the volume of scientific publications, which makes it increasingly difficult for scientists to keep up with work in their field. (...) (S)cientists search for cues to what they should attend to. One such cue is the professional reputation of the authors.” (1968, 449)

Indeed, many high-status scientists already started to use gatekeepers to screen their E-mail in the same way they screen calls and letters (Walsh/Roselle 1999, 61). The democratisation effect is eclipsed by the general scarcity of available time: to follow the discussion in a list is only possible with great effort. In the face of information overload and if there is not enough time available, scholars will be even more tempted to select and filter according to status cues (Fröhlich 1993, referring to Merton) and to ignore, as a matter of principle, messages from non-elite scientists (Hiltz/Turoff 1993, quoted by Finholt/Olson 1997, 34). In the context of discussing the future prospects of collaboratories, Finholt (2001, 30) claims that “(f)or elite scientists, collaboratories may offer more imposition than benefit.” A related argument is made by Van Alstyne/Brynjolfsson (1996, see Walsh/Roselle 1999, 66): Based on an economic model (economising on information exchange and maximising benefits from exchange partners), they argue that CMC will even

<sup>569</sup> ‘The parable of the talents’, quoted according to the King James Version of the Bible (1603).

lead to increased inequality in science as each person limits his interactions to his information peers, independent of location. In any case, the democratisation effect would only work as long as the higher academic ranks participate actively in the discourse on these general platforms – which increasingly may not be the case (see next).

(3) *Restricted forums*: Furthermore there is the possibility that specialised and restricted forums evolve to which not everyone is given access. Elite scientists could, at the same time, leave the general forums (Finholt/Olson 1997, 35; Hert 1997, 331, quoting Merz; Stichweh 1989, 35).

(4) *Direct contact with the top scholars* in a field may become more effective than indirect communication via ICT. When the contacts a top researcher has to “administer” multiply because of the new access channels opened up by the Internet, it is likely that s/he will apply anew a selection criterion based on personal acquaintance. Therefore, the OECD report concludes that, while ICT helps to improving access to information on an overall level, it would not overcome disadvantages due to a lack of direct contact with top scholars in the field. ICT use may thus lead “more to a broadening of the science base than to a change in the hierarchy of scientific institutions“ (1998, 198).

(5) *E-publishing not prestigious enough*: To the extent that the more easily accessible E-journals (and even more so self-published papers) are still less prestigious than their traditional print (or parallel P+E) counter-parts, the punch of a particular publishing house or academic association is crucial for success. Hence gaining access to the groups which control access to these prestigious publication opportunities (that is knowing the right people) stays essential.

(6) *Different costs for “ins” and “outs”*: The access costs for affiliated and unaffiliated scholars to surf the Net (Fuller 1998, 130, 139) are quite different. There are no costs if you belong to a university, but maybe considerable expenses if you are an outsider. Hence those already “in” still have an advantage.

### 5.6.3 Empirical evidence and conclusions

Apart from the theoretical arguments put forward in favour of either the democratisation or the (opposed) Matthew effect, there is some literature trying to test the two hypotheses empirically.

Based on analyses of discussion lists, it has been found that the communication space is structured so that inequality and hierarchy resist (Stegbauer/Rausch 1999) and that the “hierarchical and power-driven context is still present“ (Hert 1997, 343).

On the basis of quantitative comparative research, Matzat (1999) distinguished, on the one hand, between peripheral and well-integrated researchers, and on the other hand, between weak, strong and reception contacts. As for peripheral researchers, he can show some positive effects for those who use more often CMC tools and who are in more active Internet discussion groups. Their work is more visible to other researchers. Matzat did, however, not find evidence for a real equalising effect of Internet discussion groups for academic communication in general. Co-operations as offspring of participation in such groups do emerge, but not more so for peripheral researchers. “If there are any effects on the emergence of such co-operations at all, then they are larger for well-integrated researchers” (ibid., 13).

Against the background of this still rather limited empirical evidence (which is mainly based on the analysis of a few selected E-lists) I conclude that there are good arguments

both for and against a weakening of hierarchy in academia. There is some movement within the hierarchies, but not much. The partial weakening of traditional hierarchies will be mainly due to a change in the structure of access to information. CMC somehow equalises the opportunities of receiving relevant information. Although the top researchers have the same opportunity, it is more favourable for peripheral researchers who would otherwise not have access to these opportunities at all. While acknowledging that, by far not all, important (insider) information will be made accessible through the open networks, I hold that the level of information available to everyone is greatly improved. Those with the right “antennas” should be able to deduce at least some of the salient bits.

At the same time, we will be witnessing the establishment of new elites whose status is not based on formal grounds but on mastering the new media. An old phenomenon may come in a new form: some (probably mostly younger) members of the scientific community seem to have much greater influence due to their social skills and contrary to their formal academic status (OECD 1998, 197).

Since, this technology-induced weakening of hierarchies does not interfere with financial and organisational resources as the crucial stabilising factors for the established hierarchies, no revolutionary change should be expected.

## **5.7 Conclusions: the new distribution of roles in the age of cyberscience**

In this chapter, I have analysed how the advent of ICT is impacting on the distribution of roles and skills in the academic world. I observed that scholars have taken over secretarial, librarian and publishing tasks and that, in the future, a number of new tasks will have to be added. I came to the conclusion that what it means to work as an academic scholar has changed dramatically. This is further emphasised by the fact that the “second nature” of many researchers, namely their role as teachers, is equally being redefined. Academic teachers will not only need to master a number of new skills to meet the expectations of their future students. Perhaps the focus of their teaching activities will shift altogether from lecturing to tutoring as basic lectures will be reused or broadcast throughout the world and time will be freed for discussion. A dramatic change is also under way in the world of academic librarians who are slowly moving towards a completely new job outline. The “cybrarians” will be computer experts and information brokers in the digital sphere. They will be heavily involved in the structuring activities of info-space and they will be engaged in publishing ventures as well as in teaching. Academic researchers are likely to co-operate more deeply than hitherto with the cybrarians when it comes to finding, structuring and evaluating the increasing digital information.

When I turned to the publishing sector, I observed that the roles of all participants are being reallocated which is not only due to the advent of E-publishing, but also to the financial crisis in the market. The former is, however, providing new opportunities allowing for new solutions. In particular, many tasks that have previously been performed by the publisher are now outsourced, for instance to the academic authors and to free-lancers. Libraries and scholarly associations have increasingly become involved in the publishing business and university presses will, perhaps, be upgraded again soon. Others, like the agencies, may lose in importance as their job is taken over either by the librar-

ies or by the commercial publishers themselves. Whether the latter will have a say in the future academic journal and book market, is still an open question (and will be analysed in a later section, namely 9.1.3).

Last, but not least, cyberscience may impact on the status of individual researchers and the hierarchical structure in academia. A number of arguments have been put forward both in favour of the so-called democratisation thesis and its adversary, the Matthew effect thesis. The evidence is still inconclusive, in particular as not enough empirical research has been done so far in this area. However, I have carefully concluded that the hierarchies are indeed somewhat de-stabilised. Some peripheral (for instance younger) scholars will succeed in profiting from their eased access to information and to top researchers via ICT to the effect that their academic status (formal and informal) is rising faster than was possible in the print era. It is still too early to say whether the window of opportunity opened by ICT will not close again as soon as everyone is well established in cyberspace and hence new or perhaps old social structures will be hardened again.

As an overall conclusion, I hold that ICT has the power to impact on the distribution of roles. The traditional academia as we know it from the last quarter of the 20<sup>th</sup> century is slowly but steadily turning into a new academia that is shaped by new media of scholarly communication. The roles of scholars and of librarians are diversifying, those of the publishers and agencies seem to be narrowing down. Furthermore, the relationship between scholars and cybrarians will probably be one of co-operation instead of master-servant hierarchy. Finally, inside the research communities, peripheral researchers will in some respects be better placed vis-à-vis the top scholars, but in general still not on an equal footing.