Historical Software Issue 7: Micro Computers

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ISSUE 7: MICRO COMPUTERS

When a computer related magazine in the USA started an enquiry into the use of micro computers in business firms last summer, the staff was somewhat surprised to get as answer to the question "How many of them do you use?": "We're not really sure how many we have ...". Closer to QUANTUM members: micros have during the last years been used for data input in archives, for archaeological, anthropological and linguistic field research. More closer still: the author knows of at least four institutes in the German speaking countries that have bought their own hardware at about 30.000 DM and of approximately five or six researchers more who acquired cheaper equipment. As this is the case in the German speaking countries, where the cost of university computing centres is generally provided centrally, it is not very surprising, that in countries like the United States, where funding of ones computerwork seems (at least at some universities) to be less liberal, micros are a standing theme on every meeting of humanists or social scientists dealing with computers at all. So, while a micro computer is certainly no "software", our readers will probably tolerate this deviation from the main designation of this HSR section.

First of all the author would like to clarify, that, though he has been in close contact with about half a dozen research projects which own or use such machines, would definitely like not to be counted among the "micro freaks", i.e. those colleagues who think that the advent of the micro is a methodological good in itself and it is a big success to produce the same results on a micro one controls completely, instead of getting them from the big black box at the local computing centre.

What are the advantages of micro computers:
- While being much slower than large computers, they work for their owner only. Even if it takes 10 minutes to calculate a result and 15 to print it, that is incomparably faster than a setup where the machine takes 10 seconds for computing and 1 minute for printing, after it has been busy for 2 hours with other jobs before opening this one and the operators need 2 hours more finally to fetch the printout.
- The machine is working when you need it. No servicing on the very morning when your timetable would provide a gap for computer work, no closing hours.
- The micro is much less complex than a mainframe; it will generally crash very much less often than particularly an older mainframe will do or one that is permantly optimized out of usefullness by the ongoing research of the local department of information science.

- If your data reside in the backyard of the parsonage of the most remote village in the black wood forest, you can still take a micro there for data collection. Nothing to say about archives accesible more easily.
- Micros open an additional dimension for applications like text processing, still very often supported only badly by central installations.
- In case of special equipment (like certain plotting devices) it may be easier to convince a funding agency to provide you with appropriate equipment of your own, than the acquisition comittee of a computer centre firmly controlled by the interests of a number of specialized users, that it is needed.

On the other hand there are disadvantages:
- Micros are still very, very much less powerful than mainframes. We will have to discuss this point with somewhat more details later but it should be pointed out right here, that a statistical computation that takes seconds if undertaken with a couple of cases while testing the equipment, may very well take one or more hours, if you have finally collected, say, 10.000 cases and use a floppy.
- The available software, as many individual programs and "systems" there are, provides righy now only relatively simple statistical methods. So if you do something more sophisticated than crosstabulations or Pearson correlations, very often you'll have either to write the program yourself or transport your data to the mainframe.
- Software for micros is that far definitely less reliable than the large packages one gets used to, when using a computing centre. You may find yourself faster in the intestines of a ready-made application program than you believe.
- In very many cases (connecting e.g. a new peripheral device from another manufacturer) you may discover that to realize that connection you have to write a "real" computer program, getting well acquainted with the internal logic of your machine and sometimes even its machine language.
- If your micro crashes, you will very soon understand what the electronics and systems departments of your computer centre have done all the while. It may be very well, that you cannot do any work for a couple of weeks.

Generally speaking, you can use a micro for the following purposes:
a. Off line data input. In cases where a research institute produces a constant stream of data, employing students all the time for writing them unto forms and typing them into the computer later (or punching them unto cards), the price of a simple data entry device should be paid by the savings of the first 6 months or certainly of the first year of usage. Thinking less about how to convince the administration: the speed is going at least to double and if you have very error prone data, the use of devices doing some plausibility control right during input may result in spectacular savings of time.

b. Replacing your typewriter, providing at the same time computing power for simple ad hoc calculations. As prices go right now, the micro should win over the old OCR argument "input by a device that can be used for more conventional work as well" within the next 24 months, as far as it has not done so right now.

c. Providing you with a very intelligent terminal. This may e.g. mean, that you enter data during the day without caring what your local computing centre is doing, perform data clearing still on spot, run a few simple calculations before you leave your office, than as the last thing submit the data together with appropriate commands for an elaborate analysis to the mainframe and interpret the results computed and printed overnight first thing next morning when you return.

d. A still more existing possibility - though only beginning to be realizable - is to connect your micro together with a couple of other ones (and potentially a large computer or components thereof) to form a "local network". Roughly speaking: a bulk of computers which are completely independent of each other, but have access to a common set of peripheral devices, such as expensive large scale storage devices, sophisticated printers, plotters, typesetting devices and so on.(1)

e. If you insist upon - or are forced to do by lack of access to a computing centre - you can set up your micro as your own private main computer. Just, please, don't forget what you can do by formulating a few simple commands for one of the largescale systems like SPSS or BMDP. At least this author thinks, that the great danger coming from the micro is the possibility that the simple happiness about ones ability to produce a result with a machine, discrediting much in the early days of computer usage in history, might be right back. Very, very many things that are trivial meanwhile with the help of the software of largescale systems still require elaborate work on a micro - without getting any more relevant or worthwhile for all the drudgery involved in their production.

How shall one start getting acquainted with micros or deciding which one to buy? As a first rule: don't believe a word a salesman has told you until you have seen the machine offered proving its alleged capability with a set of test data of the same size you expect to use typically. (Such data need not be real - any numbers generated mechanically simply for this purpose will suffice.) The sale of micros is a field, where very many small companies are fighting for survival - you better should stop trusting your own brother as soon as he runs a computer store.

Get into contact with your computing centre as soon as possible. Most of them consider it meanwhile as part of their job to provide information on what to buy for which application and many have their own concept for how eventually links between the various micros and the local mainframe (which as we shall see is a very important point) should be built. If you follow such specifications as al-

ready may exist, the computing centre will usually guarantee more or less, that ready made solutions for linking the two machines exist. While this author knows of at least one case, where the effort to connect a micro, bought for the very purpose of entering data, to the main computer proved to be to much for the ressources of the unhappy buyer, not in contact with his computing centre. He had to provide for rather complicated conversions with the help of another computer a couple of a hundred miles away. (And beyond that: a computing centre, supporting a couple of a hundred users, has incomparably more negotiating power than even the most impressive humanistic scholar buying an isolated machine - in some cases following local guidelines may result in considerable savings because of agreements with a local supplier.)

Do a bit of general reading before you see a computer store. In Germany a good start might be: Rodnay Zaks, Mein erster Computer, Düsseldorf, 1982.(2) The differences between the types of processors, storage media and printers are explained here so far in non-technical language, as to enable you to see where the differences between the various components that will be offered to you are. A very important feature of the book is a long list of addresses, making you less dependent upon the computer store at the next corner. Another good idea would be to go through the last editions of one of the magazines specializing in micro computers. My choice would be "Byte" (in English) or "Chip" (in German, information supplied tends to be more compressed). Finally there's meanwhile a small market of rather specialized books which are not always easy to get via your traditional bookseller. Within the German speaking countries you might contact (among others) the following addresses for catalogues of relevant literature: Ing. W.Hofacker GmbH., Tegernseer Straße 18, D-8150 Holz-kirchen (incidentally one of the largest suppliers of micro software as well) or SYBEX - Verlag, Heyestraße 22, D-4000 Düsseldorf 12.

Becoming practical: every micro computer consists of at least four hardware components:
- a micro processor (the "brain"),
- a medium that allows you to enter commands and or data,
- a medium displying the results,
- and a storage medium (needed also if you are working with very small amounts of data - the programs themselves have to be stored as well).

In theory you could buy this components completely independent of each other; but this would need quite a bit of technical knowledge to hook up the configuration. So you will in most cases buy a ready made package, consisting of a number of hardware components with other ones potentially being plugged in later on and wrapped up with the necessary software to run the resulting machine which, to distinguish it from the micro processor, is finally called a micro computer. Such hardware/software packages are available under a large number of names. (We'll quote some of the more prominent ones later.) Particularly the more exotic ones of them are simply made up of

standard components, though, which should be judged on their own
merit, independent of the label glued upon the box of the final
product.

Beginning with the processor, one has to mention, that most of the
hundreds of brands of micro computers sold operate with a represent-
ative of one of about four or five families of processors. The
differences between those processors can usually be neglected by
the historian or social scientist, with two exceptions:
A number of efficient programs for micro computers have been written
in the machine language of one of them. Make sure that you don't buy
a program restricted to another processor as the one in your micro
computer!

On the long run more important is, that processors come currently in
three major classes: 8-bit, 16-bit and 32-bit processors. The most
obvious consequence of this difference (describing, very roughly,
the largest chunk of information that can be handled in one operation)
is the resulting speed: a 16-bit micro is not twice as fast as an
8-bit micro, but 10 times so. Much more important than this (the
limiting problem with micros being not the executing speed of the
CPU, but the time needed to access the storage media in background)
is, that the larger types of processors have many additional possi-
bilities. So one should by necessity buy only those configurations
based upon the larger ones, the 16-bit and the 32-bit processors?
Indeed, the "Beratende Ausschuß für EDV-Anlagen" of the Max-Planck-
Gesellschaft formulated recently guidelines for the acquisition of
micro computers, reaching (with qualifications) this result.(3)
Unfortunately it is not that easy for the individual researcher:
the 32-bit processor has been introduced only recently, so there
exists scarcely any tested hardware/software package based upon
one; micro computers based upon 16-bit processors do exist, but
there's still significantly less software available for them, than
for 8-bit machines. So, for the simple historian or social scientist,
the decision will mainly appear as a tradeoff: a small capability
right now or a very extended one in two or three years?(4) We have
already presented some reasons, why we are sceptical about the all
to enthusiastic reception, some people give to the micro: a con-
servative decision on the save side might be, to buy 8-bit machines
for all data-entry applications right now and to wait about 2 years,
before buying equipment for realizing more challenging ideas, if
one can do.

The second component one must have is a keyboard. One thing to look
at: if you can afford a machine, where it is connected with a cable
to the remainder of the configuration, rather than being build into
a box containing all components, working for more than just half an
hour gets considerably more comfortable. (But this can increase the
price quite a bit as well.)

More important for price and comfort is the question of how to dis-
play your results. If you use a machine for data-entry only, you
can usually avoid buying your own printer, which will save between
1.000 and 10.000 DM. You should not economize on a video display.

If you avoid it completely and restrict yourself to a teletype, your working speed will be much slower than with almost any video display, and if you can afford a more sophisticated editor this difference is even more dramatical. If on the other hand you buy a machine, where you can use your old TV set instead of a video display, you'll spend your savings with your optician. (All the time assuming that you use the equipment for serious production work, that is, watch the screen regularly and with concentration for a couple of hours. If you just buy a toy computer for learning how to write amusing programs, this question is not so important.)

At this point we should talk about prices: useful configurations with micro processor, keyboard and a video display can come at 3.000 DM and even somewhat less, if you use one of the numerous bargains offered by computer stores. Even buying a cheap (and slow) printer may leave you still below 5.000 DM. (As all the prices you are going to hear when you buy a micro are without VAT, we follow this practise in this paper as well.)

The real problem with all micros right now is the question of secondary storage.(5) Concentrating on the main possibilities, three solutions exist:

- A drive for a magnetic cartridge. This can come as the same recorder you have used that far to record music with, or as a better (and more expensive) digital recorder. This is by far the cheapest storage medium available, with prices starting considerably below 500 DM. There are two problems with this kind of device: if you use it for data input, it is an excellent and sufficient medium. (At this time there is at least one configuration used for data input satisfactorily in an archive employing a tape recorder, that has cost slightly less than 4.000 DM last spring.) But you are completely dependent upon your computing centre to provide a device that is able to read your type of cartridge - and this particular service is unfortunately provided by only few of them. If you go beyond data input you should forget about this solution - the limitations are severe and you will despair while you spend quarters of an hour until your machine has read some data. (If you have a rather sophisticated configuration, it may pay off, though, to buy a drive for magnetic cartridges as an additional medium for backup storage.)

- The most popular storage medium right now, being often almost as expensive as processor, keyboard and video display taken together, is the mini disk, floppy, "Diskette" or whatever the marketing department of a given manufacturer comes up with. Known best as "floppy", this medium consists of a quadratic envelope that contains a magnetic medium which can be written unto and read from by machines called disk drives. Floppies come in two sizes: 5 1/4 inch ones and 8 inch ones. The smaller version is considerably cheaper and skiping through magazines one gets the strong impression, that development - as far as floppies are concerned - concentrates upon them. There is a very serious problem, though: while 8 inch floppies are usually written to in one of two main

standard formats (with minor variations) the smaller kind is hand-
led in almost innumerable ways. As a result many computing centres
are able to read 8 inch floppies while those, which can read
5 1/4 inch ones at all, restrict themselves to a very small num-
ber of the possible formats. Quite beyond the question of "how
to get your data to the mainframe": you will have a very reasonable
chance that a colleague, you want to cooperate with, can read your
8 inch floppy, and almost none, that he will be able to do so with
your 5 1/4 inch one. So, if you have any chance to afford it, get
the 8 inch variety. (There are a couple of differences between
8 inch disks as well, e.g. the density of the data written unto
them. But as a rule this should not create all too serious trouble.)

- Relatively new, more expensive than a floppy, but in many respects
considerably more attractive, are devices called Winchester disks.
While floppies are taken out of their drives as you like, providing
you with a theoretically unlimited background storage, that is
however accesible only one (or two or how many drives you buy)
floppy/floppies at a time, a Winchester drive contains a storage
medium that can not normally be removed from the configuration.
But, while a floppy contains between 128 K byte (roughly: 128.000
characters) and slightly more than 1 M byte (roughly: 1 million
of them) a Winchester drive will accomodate something between 5 M
byte and 40 M byte accesible at an operating speed being consider-
ably higher. How one should interpret these numbers of bytes is a
complicated question. As a rule of the thumb one might say:

a. A one-person project, using a set of data just for one particular
study will generally be able to store all that is needed on one
floppy at a time. As it is a must to create backups, and a wise
move to keep different "generations" of data modified step by
step, you will need a number of them in the background, but can
keep mounted just one during production.

b. With the exception of the most trivial computations operating
on, say, less than a hundred cases, you will have to organize your
work doing something else, while your machine is computing the
results, when you use floppies.

c. A project employing a number of students over a longer time will
almost certainly create files which have to be analysed as one
file, but are spread across a number of floppies (at least after
additional variables have been computed). This may involve rather
time consuming operations.

d. It will take 10 minutes or less to produce a backup copy of a
floppy just modified.

e. With the possible exception of long-range data bank applications,
a Winchester drive will be sufficient for the requirements of con-
tinuous storage of practically all projects in Social-Historical
research.

f. In very many cases the greater access speed of a Winchester
drive will make it possible to work truly interactively, that is,

ask for a computation, wait for its completion and continue imme-
diately with the interpretation of the result.

g. Quite beyond the higher price of the Winchester drive in itself,
one has to provide besides it always either a reliable link to
another computer or purchase an additional storage medium. (Not
only for longrange storage of data not needed for a longer inter-
vall, but also, by all means, for external backup copies.)

h. It is good practise to create a backup of ones database at
least once a week. Creating a complete backup of a Winchester
drive unto a set of (up to 40)floppies may well take half a day,
having to exchange floppies every 5 or 10 minutes. Other additional
storage media are more expensive. (E.g. a more sophisticated tape
cartridge.)

Before we started our discussion of secondary storage, we priced con-
figurations for minor applications at about 5.000 DM. Where do we
stand right now? One has to differentiate between four classes of
applications:
- Simple data-entry devices should come at 5.000 DM or below.
- Enabling you to process texts, that is in particular print clean
  copies of manuscripts will bring this up to at least 7.000 DM,
  with no upper end - both in quality and in price.

- Employing a micro as a really intelligent terminal, operating for
  a larger number of routine applications independent of a host
  computer or intending to provide yourself with a standalone ma-
  chine for simple applications, will take at least 10.000 DM or,
  if you have any intentions at graphics (many micros are able to
  provide beautiful plots) 12.000 DM.

- If finally you are going to provide the infrastructure for more
  than one research project (providing more than one terminal at
  the same time, or allowing them at least sufficient storage to
  work without having continually to flip storage media) or if
  you want to support true data base applications you will imme-
  diately reach a price somewhere between 20.000 DM and 30.000 DM.
  Again, no upper limits.

Now a few short remarks on some of the more prominent micro com-
puters(6), without aiming at completeness, just to give a few hints
where to look. All of them can be bought in a number of configurations
with a great variance in performance and price. For us this is the
reason why we avoid quoting prices or detailed product descriptions -
a task beyond the pages dedicated to this section anyway. For you
it should be a reason to take one more point into consideration when
deciding about your purchase. Do you think you will want to expand
your micro in the foreseeable future or do you want to connect it
to another (larger) computer? If any of these questions is to be
answered in the affirmative, your computer should have a number of
empty (and standardized) slots, into which one can later insert
PROMs (a kind of memory expansion that already contains a program)
and it should have at least one interface available for later use,

which is not needed for the equipment you buy first. To enquire about this second point you should ask if an unused V 24 Interface is included in the price; if this is not the case, you should check in detail which kind of equipment you can connect to the interface offered instead.

The most simple micro computers you should consider - often considered to be equivalent with "personal computers" - are the Commodore family, the Apple family and the TRS-80 family. All three families are pretty widespread, so you should have neither problem to get them serviced. Software is relatively easy to come by (but see below) and they are well tried. A problem with this class of machinery is, that the very cheap standard configurations will have to be expanded for almost any serious work beyond data input. When you consider, what you will in all probability have to buy to get one of them ready for real work, you will have spent scarcely less, than you would have done buying the basic configuration of a machine more expensive - but now being at the end rather that the start of your potential of expansion. A minor flaw (but not to be underestimated for data input) is the keyboard that is fixed to the setup.

The probably cheapest "complete" configuration is a micro computer called OSBORNE 1, which comes at between 5.000 DM and 6.000 DM. Nevertheless it will need less extra equipment to make it useful than the other three ones and it can be transported most easily. (Indeed it can be folded into something like a medium sized suitcase and is sold by a slogan like "take your computer with you like a suitcase".) I would definitely like to be fair to this machine that gives you good value for money and might be the ideal transportable data entry machine - still it has such a small videodisplay (about 5 by 8 inches), that in my opinion one needs a heroic character to use it for long continous work.

The four brands mentioned that far all use 8-bit processors, as does the vast majority of ready-made configurations available right now. So does a micro computer known as ALTOS-8000. Being more expensive than the ones mentioned and more in the middle or upper prize range it is certainly more powerful and expandable. Relatively old and robust, it can use a large share of the software available right now for micro computers. Indeed, if you want to buy one right now (instead of waiting for the further spread of 16-bit machines), you might choose it. In any case it would be wise to get some recent pricing information about it, to compare what you get out of your money in buying other brands.

As we mentioned already, the future will probably belong to at least the 16-bit, if not the 32-bit processor. An indication for this is among other things, that IBM has entered the market at this level with an "IBM Personal Computer". As often with IBM the system software is extremely comfortable, the aids for getting acquainted with the machine are probably the best on the market (you dont get a manual, but print it as part of a computer directed course in how

to use the machine) and very expensive. As a result the current
opinion among reviewers in relevant magazines seems generally to be,
that when it comes to production work, you dont get enough out of
this machine for your money. As the reasons for this seem to be
buried in the internal logic, the large amount of software current-
ly in development for this machine - as many software producers ob-
viously expect IBM to win a large share of the commercial market,
true to its dominant position in the field of mainframes - will pro-
bably not change this.

Less well supported from the software side (though most of the soft-
ware intended for IBM should be useable with it) is a machine known
as SIRIUS 1, which is also based upon a 16-bit computer. According
to the reviews quoted in the footnote above, it should give one
good value for money already. Indeed, if one wants to risk buying
a 16-bit machine right now, this might very well be it. What attracts
me very much indeed - and would be the main reason why I would re-
commend this brand to anyone - is that it is supposed to become use-
able within any ETHERNET; you remember: a local network, where you
can lay a kind of phone wire within an institute (a coax cable in
fact) and simply "plug in" a large number of devices, sharing storage
and other media between them.

If one wants to have available the existing software for micro com-
puters today and have access to the advanced capabilities of 16-bit
machines, a good idea would be to look closely at the DEC Rainbow
series. The computers of this family have an 8-bit processor as well
as a 16-bit one. (An interesting de-facto comment upon what is ex-
pensive with computers nowadays.) So you can use on this machine the
existing software right now and have a reasonable hope, that you
can gradually switch over to the more advanced one as it emerges.
If this reviewer gets involved into any buying decisions within the
next year this will be the machine most carefully to be looked at.

A very good advanced brand of an 8-bit machine on the other hand
seems to be the family of machinery distributed under the name Tele-
Video. Their most interesting feature is, that these machines have
been designed from the beginning to fit into a limited local network.
More explicity: you can succesively buy 2 or 3 (or more) of them
within different departments of one faculty, acquiring floppy disks
for the time being, and when you feel that the available storage be-
comes a serious handicap you buy a smart mass storage devise bet-
ween you, which can serve all your independent machines.

Particularly looking at the software situation (see below), the
WICAT System 150 might be the best buy of them all. Unfortunately
the - indeed very "complete" - basic configuration, which includes
a 10 M Byte Winchester Drive already starts at 24.000 DM. The most
attractive thing is the software supplied and available with this
configuration. This system operates under UNIX as an operating system
and provides therefore - very unusually in the micro world that
far - a very large number of programming languages. This of course
implies, that using software from "real", i.e. big computers becomes

a lot easier. Most spectacular of all: a version providing the com-
plete BMDP software allegedly exists under the name STATCAT.

Coming to less conventional answers to the question "what to buy?".
One of the most widely spread video display terminals for computers
in general is called VT 180. If your computing center provides an
interface to this device (or you are among the lucky few having one
in your institute already), there exists a good way to kill two flies
with one stroke. As announced in CHIP 1982/8, pp. 120-121, there
exists now a (cheap) platine, that will turn any of these terminals
at wish into a personal computer with its own intelligence. Taking
into account, that you can relatively often find cheap VT 180's in
second hand offers, this might be a way to acquire cheap equipment
in any case.

Second hand offers should not be recommended in general, except you
are intend upon engaging yourself very much with your computer. But
there exists one possibility which is potentially of such a great
value, that it just shall be mentioned here. Most of the wizzards
of the field agree that the VAX will in all probability become very
dominant in the computing centres of the 80s. The VAX can be very
easily linked to all computers of PDP's 11 series. (11/xx, where xx
stands for the particular type.) As a matter of fact much of the
software can be exchanged between those machines. FDp 11's have
been very popular during the last years, so one stumbles from time
to time across one at a rather low second hand price. If you can
acquire one of them, you may get for 30.000 DM - the upper range
a typical micro should cost - a machine, which you can use to run
program systems like a subset of BMDP, GLIM, MINITAB, P-STAT and
even SPSS/11. (Though this offspring is far, far less potent then
the well known father.) And best of all: practically every program
developed on this "your" computer would run on your central in-
stallation, if it is a VAX and, with reservations, viceversa.

Already when formulating why using a micro does not have advantages
only, we mentioned that a lot of things traditonally a computing
centre does for you, you have to take over when using one. Beyond
the hardware (which - hopefully - will simply work unattended) this
means, that you have to care for all the software, including such
components taken usually as granted as the operating system.(7) This
is particularly important, as very many programs have been specif-
ically written to run under a certain operating system of a micro.
So. when taking software into consideration while making your buying de-
cision, take great care, that you do not plan to use software com-
ponents concurrently, which require different operating systems.

Generally speaking the situation is this: Commodore and Apple both
feature operating systems of their own. As between them they hold
such a large share of the market, very many programs exist in ver-
sions for both environments. In all other cases with 8-bit computers
one should look for an operating system called CP/M, having been
designed to run on practically all existing 8-bit machines. (Though
"dialects" exist.) Several systems, like the TRS-80 family, feature

an operating system of their own, but can be made to work under
CP/M as well. This system will give you access to the largest
range of 8-bit software on the market. If this system is not oper-
able on a micro, check first, if the machine uses some kind of
derivate of it. (Simply ask your supplier to run a number of pro-
grams which are supposed to run under CP/M or get at least a prin-
ted explanation, why they should, if you cannot get hold of a pro-
gram for a practical test.) If this is not the case as well, think
very, very carefully: you should be completely sure, that you will
not need any programs besides what is being offered by the manufac-
turer before you buy such a machine.

In the 16-bit range the situation is more complicated. A version of
CP/M exists (not guranteeing necessarily that a program written for
an 8-bit machine will run on a 16-bit one as well), but cannot be
seen as equally dominant. IBM decided to acquire for its personal
computer in this class an operating system of its own, which can
be run on other machines as well (MS-DOS). As already mentioned
the simple name of IMB guaranteed, that a number of developers
started producing suitable software. So, while CP/M should be more
flexible in this area as well, MS-DOS should be given quite some
consideration. In the long run even more important might become
an operating system known as UNIX however. Originally designed to
be in principle independent of the hardware, it is already very
widespread among machines of a larger size than we talk about here.
As it has been shown to be able to run on 16-bit micro computers as
well, it could very well open up by far the most long term possibi-
lities. (A micro computer designed specifically to run under UNIX
- called ONYX - has already been advertised for in American magazines,
I could'nt get hold of any report on it however.)

Coming to software in a narrower sense, the most appropriate thing
to speak about in a "software section", we will nevertheless re-
strict ourselves mainly to general remarks, as the number of pro-
grams and systems available for micros is so large, that it would
simply overburden this already long report with information that
after all is not so central for buying decisions than what has
been described before. So many programs available? The situation
is extremely good then? Unfortunately things are more complicated.

a. Software for micros is very cheap indeed. In volume 8, issue 10
of BYTE magazine (October 1982), pp. 400-404 "EDU - Ware's Sta-
tistics 3.0", an (educational) "statistical program system" is
evaluated (quite favorably). It's priced at 29.95 US $. What you
get for this agreeably low price, though, are just a few possibili-
ties for describtive statistics and a few statistical tests (like
the T-test), while even such "advanced" things as crosstabulation
are beyond the scope of the package. More generally: there are very
many very small and very specialized systems around. You need a lot
of them before you have a really general library of applications
programs.

b. The micro computer market is strictly controlled by commercial
applications. Typical groups at which the selling strategies aim,

are professionals, small business owners and so on. So an incredible number of "general programs" exist, which are general enough to administrate the typical accounting of all dentists or all sellers of lavatory equipment, and such applications are a main concern of the relevant magazines as well. More generally: it is hard to find programs general enough, to be not in connection with a typical application and its harder to get information about them. A valuable source for information about strictly statistical system has during its last few issues been European Political Data, a newsletter published in Norway. But this source is not so clear as well, as it mainly publishes announcements of availability, no software reviews.

c. Many micro computers offered contain a set of basic software as part of the package. These sets usually contain something which is often announced as "general statistical packages", usually under resounding names like SUPERCALC. For these general packages unfortunately the same holds true than for the "general programs" just mentioned above. Most of them support scarcely anything but descriptive statistics and tabulations. To be fair: the rational decision makers in business seem to have a very well developed sense for toys, so when it comes to make simple things elaborate, the software available is excellent. You'll find e.g. astonishingly well developed systems for graphical display (in four colors, and sounding a bell if something particular exciting is going to be brought to the screen) at very reasonable prices - if you can afford the hardware to make use of it. That is only a poor excuse for, say, a partial correlation analysis however.(8)

d. There are more advanced systems for statistical analysis, which have been designed for use on a micro computer. European Political Date 43 (June 1982) is particularly enlightening in this respect, containing announcements of availability for 4 general statistical packages, one specializing in Exploratory Data Analysis and one for Time series Analysis.
Leaving Exploratory Data Analysis and Time Series aside, one of the systems (named AIDA) explains a bit more about its contents and its limitations (the system is intended for Apple computers only). It claims to offer multivariate analysis including (and possibly identical to) a "powerful regression package". As can be seen from the description of two systems offered as an addition to it, crosstabulation and multivariate analysis - despite the claims just mentioned - are contained within separate modules, which have to be ordered (and paid) independently. AIDA allows the analysis of up to 11.000 data points (cases times variables). This implies, that when you analyse 2.000 cases, as might be fashionable from the example given within the social sciences, you have 5 variables per case left which you can analyse.
Two other packages, designed for the Apple as well, claim to support in both cases Discriminant- and Factor Analysis and one of them each claims ANOVA and Cluster Analysis respectively. Both of them unfortunately give no indication of the maximal number of cases and variables.

Finally a product called Micro SPSS is announced, containing des-
criptive stuff and (besides a couple of commands of minor interest)
BREAKDOWN, CROSSTABS(9), NONLINEAR and MULTIPLE REGRESSION. This is
no SPSS Inc. product however. And while a formal test report could
not be gotten hold of, informal informations received about this
system are definitely unfavorable. So one should insist on a de-
tailed representation before acquiring it. (QUNATUM member Erdmann
Weyrauch announced his intention to submit a report on Micro SPSS
in a later issue of HSR.) Anyway: Micro SPSS claims to be able to
handle 2.000 cases and 200 variables if run on a configuration with
128 K central memory and 500 (512?) K of secondary storage.
Happy news at the end: Micro SPSS comes at 1.500 DM, one of the
others at 1.950 DM, but the remainder at between 200 DM and 235 US $.

e. Operating systems for micro computers are far less powerful than
the ones you are used to. In particular there is very often no
editor included. Especially if you are handling larger amounts of
data it might be a wise decision to buy a small Database Management
System, which will not only make the data handling much easier, but
can significantly speed up data input by providing masks and plau-
sibility controls. A very good buy for CP/M systems in this context
is DBASE II.(10)

f. Without intention to discredit the many well written programs:
the majority of the software for micro computers has been written
under considerable pressure of time. In all too many cases this
means, that the programs still have incomparably more bugs than
those one is used to from mainframes. In even more cases this means,
that hidden assumptions have been built into the programs quite
firmly which become apparent only, if one intends to use them in
production work. Just an example: there exists a small editing
program for the PET, a very small computer, the first one of the
Commodore family. Originally intended to produce pretty printed
letters, it was written to work with letters of something between
20 or 50 lines of length. When looking for a program to use for data
entry via a later representative of that computer family, it was
selected. As it turned out, the limitation on the number of lines
to be processed was built in so intricately - by simple reasons of
writing the program as quick as possible - that a first attempt at
changing the number of maximum lines to 1000 resulted in a program
that needed minutes to enter a single line of data. It took about
2 days to get the underlying assumptions out of this program to make
it accept a line of input without noticeable delay. If such changes
are undertaken by somebody who hopes to learn programming in the
course of it, they will take considerably longer.

So what remains as a summary of the software situation? Software
appropriate for Social-Historical Research with micro computers
exists. There is scarcely any hope however, to acquire one system
that will provide with all the capabilities a typical research pro-
ject needs. Three solutions remain:

- buy a large number of small programs and hope that eventually you'll have all you need;
- learn programming yourself and modify programs that are already close to your applications;
- keep a good link to your mainframe computer for all the more complex things you want to do.

If one insists upon being as independent as possible, one should probably try to spend somewhat more money (say about 30.000 DM) providing for a larger central memory (128 k byte or above of available memory, that is, after the size of the resident parts of the operating system has been deduced) a fast storage medium (a Winchester drive) and a FORTRAN compiler, not usually included in the BASIC dominated software of the micro world. Then the best long term solution might be to try the implementation of one of those larger systems, which from the very beginning have been designed for portability, as e.g. P-STAT, MINITAB or GLIM. This will currently unfortunately need more than a weekend programmer, and you might have to include a couple of man months for a (semi)professional in your financing considerations. (Admittedly taking a pessimistic view.)

This reviewer thinks, that the STATCAT with its offer of BMDP mentioned above, might be an important hint at the future. The important difference between large scale computers and micros, when looked at from the software side, is not so much their size: when SPSS, BMDP and the other "big shots" were first thought off, very many "large scale" computers were smaller than the larger micros are today. Indeed, when the General Inquirer (an early and for some time rather prominent system of content analysis) was implemented first, greatest care was taken to allow running as many steps as possible on machines which are smaller than any micro computer discussed in this paper at all. The important differences are two: the micro world - aimed at the beginner with few programming knowledge - is dominated by BASIC; large scale computers still by FORTRAN. The second important difference: the external storage media of the micros are still frightfully slow, if it comes to serious production jobs.

Both situations are changing - it is not so important, if one believes that PASCAL, strong among micros, will ultimately conquer the mainframes or that operating systems like UNIX, with its intermediate language, will smooth over the hardware differences behind a relatively unique environmen in which the software is conceptualized. From the point of view of Social Historical Research one has to cherish the second hope, as every micro more that is able to understand a large number of programming languages, is one more direct step towards a situation where the "big" packages are running on "small" computers. But even if PASCAL should be the one to overcome the obstinate clinging to the first programming language one has learned - explaining so many developments during the last years - that situation will eventually arise. And the multiplying Winchesters are already now a very wide step over the limitations posed right now by the older media of background storage.

FOOTNOTES

1 If you are interested in the possibilities that are existing al-
  ready, you should best contact the next XEROX representative for
  information about ETHERNET, developed and sold by that firm.
  ETHERNET is certainly not the only concept around, but XEROX un-
  dertakes major efforts of getting understood by company executi-
  ves, so you may profit from the material provided for them. A
  more formal (but still short) description of local networks in
  general may be found in: Eugene Lowenthal, Database Systems for
  Local Nets, in: Datamation 1982/8, pp. 97-106.

2 For those among our reader which do not read German: originally
  published in the United States as "Your First Computer".

3 Anlage zum Protokoll der 87. Sitzung vom 5. Juli 1982.

4 The BZB Sachmagazin für Bürotechnik und EDV published in its
  May issue of 82 on pp. 6-8 a survey of the opinion of the major
  manufacturers under the title (not completely supported by the
  interviews themselves) "In zwei Jahren nur noch 16-Bit-Mikros?".

5 A more extensive treatment that is easy to understand can be
  found in Zaks book just quoted and, besides that, in BZB Sachma-
  gazin für Bürotechnik und EDV 1982/10, pp. 52-61. If you read this
  you should as well read in the same magazine in 1982/11, pp. 24-32
  on the specific problems with data security and the production
  of backup copies produced by the different classes of media.

6 It would be a good idea to read a couple of system reviews in one
  of the specialized magazines before you contact a supplier, as
  this will show you what to look for. Good starting points might
  be: For the low end of the price range: OSBORNE 1: in CHIP 1982/1
  114-115 and in BYTE vol. VII issue 6 (june 1982) 348-362.
  The newer representatives of the widespread Commodore and Apple
  families: in BYTE vol. VII issue 8 (August 1982) 366-376 and par-
  ticularly a comparative review in CHIP 1982/7 40-46.
  More exotic but interesting for comparison: Northstar Advantage,
  in CHIP 1982/6 48-51 and Gemini-Galaxy-1 in CHIP 1982/10 138-140.
  In the upper halfth of price and range: SIRIUS-1 and Hewlett
  Packard HP-86, both in CHIP 1982/12 and the first one in Micro
  Computer World 1982/10 32-33 as well.
  One should usually consider only reviews and test reports of the
  last 12 months. In the current development one might say, slightly
  overstating the case, that a micro computer where within 12 months
  neither the number of offered hardware components, nor the avail-
  able software, nor the price of the components did change signi-
  ficantly will not be worth considering anyway. (This is not to
  say you should not buy a machine, no report about has been pub-
  lished during the last year. Just don't take older reports all too
  serious.)
  When this "software" section was more or less completed, the author
  was provided with copies of the RRZK Kompass Nr. 20 and 21 of
  October and December 1982 (the newsletter of the Regionale Rechen-
  zentrum in Köln). They contain a extremely valuable survey of

existing micros with precise product descriptions by K.Peschlow
that influenced the following descriptions of the TRS-80 family
and the WICAT system 180 and caused the description of the DEC
Rainbow series. Other systems documented there, but by various
reasons not included here, are the KONTRON Psi-80, IMS 5000
SX/8000 SX, the KONTRON Psi-8000, the Olivetti M 20, FORTUNE
32:16, CORVUS CONCEPT and the CROMEMCO CS/DPU. TeleVideo and
ETHERNET have been described solely on information gained during
sales representations.
Last, not least, the author would like to thank all members of
the electronics department of the Gesellschaft für Wissenschaft-
liche Datenverarbeitung in Göttingen, particularly Dr. Koke. While
not to be made responsible for any opinion or view represented
in this paper, they were for a long time a never failing source
of information to the author.

7 On "software" as a general term, with special regard to the micro
situation, see a good overview in BZB Sachmagazin für Bürotechnik
und EDV 1982/12, 24-30.

8 European Political Data 44 (September 82) announces on page 55
not less than 4 software packages for graphical display on an
Apple, priced between US $ 125 and 1400, indluding a program for
the "statistical representation of spatial data", i.e. for the
production of simple thematical maps.

9 Not operative according to verbal communication.

10 On this system see Byte vol. 7, issue 7 (July 1982), 412-416.
On some cheap alternatives CHIP 1982/11, 168,171.