Archaeological Information
An Information Scientist looks on Archaeology

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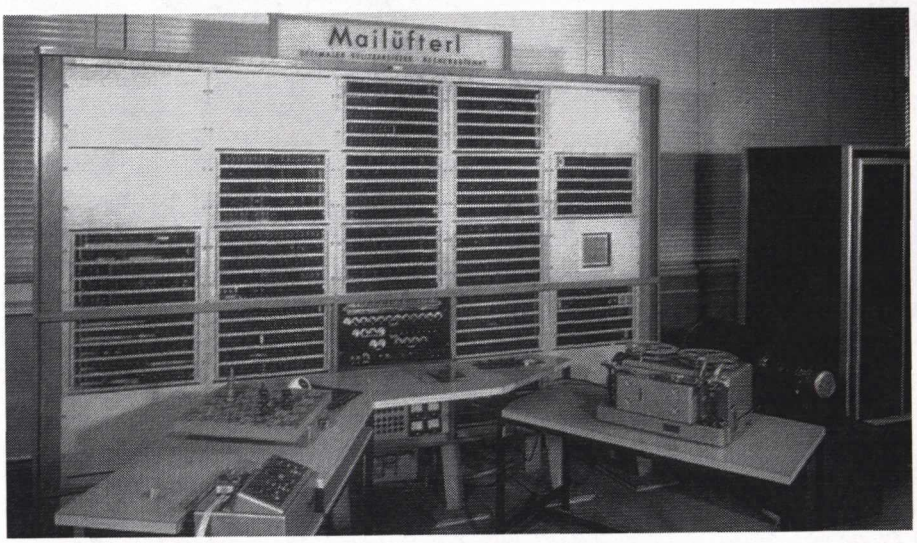
Since I saw the agenda of all your meetings and assemblies I know that the honour of being one of your opening speakers is much bigger than I thought when I accepted. But my task is proportionally more difficult. What can I tell you about archaeological information that you do not practise already? So please do not expect revolutionary news (you don't anyhow). I can give you merely a choice of philosophical considerations: what is information, how to treat it, what did the computer contribute and alter, how do I see the particular features of archaeological information and how do I see the future?

Once in a while a step back and some thoughts about what one is doing is a privilege of the human being and it can be extremely valuable for the daily work. Therefore this is a theme suited for an opening speaker.

I have witnessed the computer development during the second half of the 20th century, I was able to technically and scientifically contribute a little, and also on the international level, and I teach informatics since 55 years, two lectures a year. And you know, after five repeated lectures you begin to understand about what you are talking.

The agenda of this event calls me the "inventor" of the machine "Mailüfterl" which was the first thoroughly transistorized computer on the European continent (England was, of course, ahead). Let my slightly correct. A computer is not "invented" its structure is trivial and what is called "John von Neumann Architecture" was created by God, in the human being and already in animals. The pioneer computers were a problem of decidedness and execution strength, fighting against the conviction around the pioneer that such a thing will never work properly. And similar obstacles.



Mailüfterl: The computer designed at the Technische Hochschule Wien from 1956 to 1958, fully transistorized and with "functional bits" (forerunners of micro-programming)

My computer was unique also in the sense that I had no backing of any institution or research commission it was the personal enterprise of young university assistant, tolerated by the ministry. (During the decisive years I had no boss ...) The necessary money for somehow compensating the development team came through an exceptional channel from the Viennese Bankers Association and almost all components were gifts of the Dutch, Austrian and German industry.

The main problem was of course, seven years after its invention, the transistor. It soon turned out that only Philips in Eindhoven could and would help, but what I could get were hearing aid transistors. They would not switch very fast and so I said 1955 in Darmstadt at the First German computer conference with international participation that for our plan we can not think of a Whirlwind (the famous MIT computer of that time), but a "Mailüfterl" (a friendly Viennese May breeze) might come out. The German professors convinced me to keep Mailüfterl as the name of my computer and so I did. (We achieved anyhow a speed of 133 kc/sec.).

Electronic Archaeology

Directly I did not have to do in my life with your problems, but in the first section of my professional career I had as neighbours a kind of archaeology of information technology. The German Army had neglected Radar technology although there were some insights and indications, here in Austria (measurement of the height of rain clouds in Styria) and in Germany (Radar experiments in Silesia). When the German Air force started a programme in the fall of 1943 it was indeed too late. But I managed to get transferred into it and this enabled me to complete my diploma and to escape from the retreat of my unit through Yugoslavia. In Radar technology, the British advance could not be compensated. But there was a chance to learn from the enemy. An institution was created where all Radar technology devices found in shot down British and American planes had to be sent. They added up to a useful collection, but the devices were incomplete and most of them were damaged. The analysis of the material was not dissimilar to archaeology. Missing elements were to be added, damaged items to be repaired, at least virtually, but in many cases they first had to guess operational principles and functions. It was indeed something like archaeology of electronics.

Archaeology obviously is a lot more than information processing, but there are a number of close mutual involvements. This relation I describe today out of the view of information technology, and hope that some gain will result for you.

The title of the Congress, "Enter the Past", correctly involves the four dimensions of our cultural inheritance. There are the three dimensions of the spatial extension of which we are trained to get them reduced to the two dimensional picture spatial models would of course give better perception, but they are not so handy. And there is as the fourth dimension the time elapsed since the flourishing of the object as well as the time required for your work and your descriptions. What you do is of course information processing, in the framework of your rules, of the rules of archaeology; you do it with your experience and your derived reconstruction principles. To all of that there is a context that can not be seen at the excavation ground but which must be discovered by other considerations and which must be used the right way.

What is Information?

Information can not be defined and, therefore, must not be defined. Because definition means restriction or limitation, but on the other side of the limiting line of the "definition" is again information. Everyone has received and processed information, his body does that automatically. You know what information is. I prefer this notion in full generality: no definition.

Digitalization expresses information by 0 and 1, but even that does not restrict the generality. The big step is digital processing: the logic components of the computer restrict processing to formal model processing.

Archaeological Information Processing

Presently in the Palais Harrach here in Vienna there is an exhibition "Budapest and Vienna between Historism and Avantgarde" which shows many Hungarian treasures. One of them is a painting by Károly Ferenczy called "Archaeology" which presents your effort by its main features: two columns, i.e. surface remainders which invite for closer inspection, an excavating crew, a not yet discovered statue and the commanding scientist. One can not expect that the artist included formally the dimension of archaeology with which I will deal: the information aspect. The imagination of the spectator adds it anyhow.

In Meyer's Big German Universal Lexicon I found under the keyword archaeology the sentence: Regaining lost connections and reconstruction of only fragmentary remains are large activities in archaeology. This is a game between information and redundancy and the same game is also a means of style in architecture: the surprising elements, suddenly impressing, stand versus the repetition of already seen elements; the mighty portal for instance versus the long front of windows.

Many floors yield an even bigger number of windows, maybe ornamented systematically with different ledges. Extended to the height instead of to the width, the result is the tower. The pyramid is somewhere between, but has no windows. The information, the element of surprise, can be the

entrance or the roof. (See also below: An other Distinction of Information)

When the Caliph al-Mamun (811 - 833), the first during the last 1500 years who wanted to reach the alleged hidden treasures, tried to enter the Cheops Pyramid (Zemanek 1981), he had to pierce a corridor the one by which the tourists of today get access. The Caliph found no treasures and the entrance was discovered later to be in the upper third of the same (correct) side. With entrances one may have problems even today. The architect provides for instance five of them, a typical redundancy of style. The information is: only by the most left one the visitor can get in.

Norbert Wiener, the father of cybernetics, has contributed a really new field of mathematics by a book with the title "Extrapolation, Interpolation and Smoothing of Stationary Time Series" (Wiener 1949) which excellently - but extremely theoretically - describes the information handling of archaeology:

extrapolation:
the extensions of the object must be virtually added,

interpolation:
the missing parts of the object must be virtually added, and

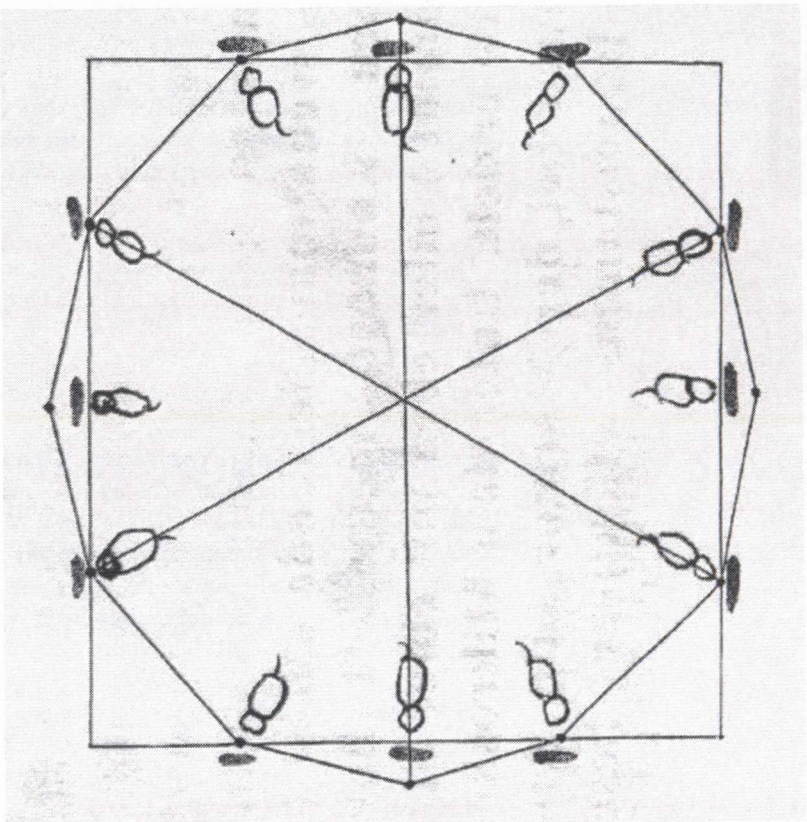
smoothing:
damaged parts must be (virtually) completed.

I was, by the way, impressed by the amount of statistics which, as your agenda tells, is taken into the services of archaeology. Still, I do not think that Norbert Wiener's theory of time series is of any use for archaeology. But extrapolation, interpolation and smoothing is the precondition for interpretation and virtual reconstruction of archaeological objects. You all are indeed information processors.

Archaeology like any other science applies a particular form of information processing. Information processing technology can be applied where ever routines can be made useful and this is everywhere. Consequently computers today are in every office and laboratory, in every factory and company. There are already more computers than cars.

We can be proud of what we have achieved. But I rather suggest to be modest: the possibilities and the power of modern technology invite us to underestimate the insights and the knowledge of our ancestors.

I can give an example concerning the bible, the first temple in Jerusalem. In two places 1 Kings 12, 23-26 and 2 Chronicle 4, 2-5 the bible speaks of an iron bowl called "The Ocean", with a diameter of 10 ells and a circumference of 30 ells. The wrong conclusion is that they thought that was 3. Artisans in wood and stone were able to produce very precise circles and would clearly know that n was larger. There is an interesting fact behind: the quadrature of the clock where " " is indeed 3. The bowl was placed an 12 iron bulls arranged in a dodecagon, a pattern which can be seen on each clock dial. If a square is drawn through the points 11, 1; 2, 4; 5, 7; 8 and 10, this square has precisely the area of the dodecagon and the relation between the area and the dodecagon diameter is exactly three.



Quadratur der Uhr: This graphic, in which the square is precisely equal in area to the dodecagon, has a biblical background

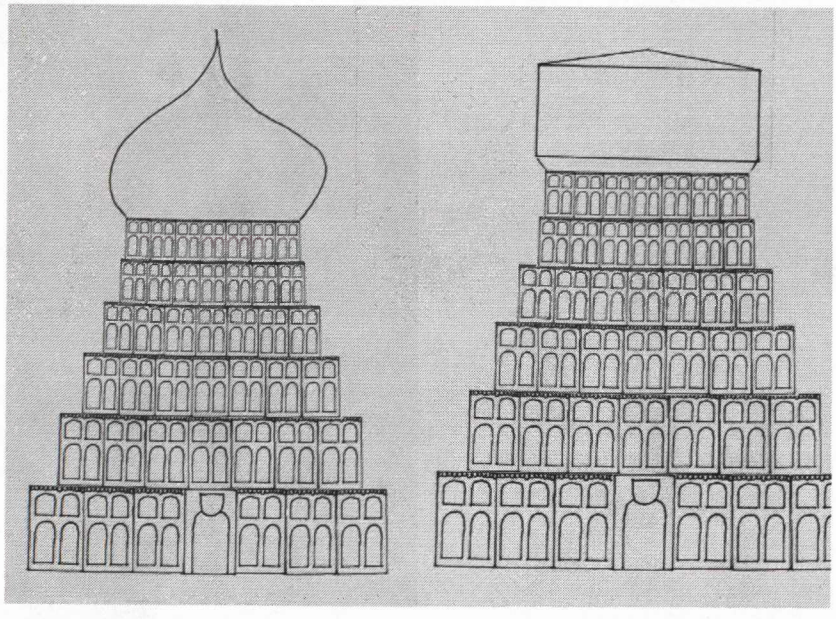
My subject here is the information which archaeologists process and indeed you all are information processors. Your profession has processed information long before information technology came into existence and long before the notion of information got its modern context; originally it rather meant an aspect of education. What my profession has achieved is the development of information processing to an abstract science which deals since 50 years with many fundamental aspects of information so that now how I look on what you do might be helpful, might be inspiring for you, for your methodology. And in order to inspire your inspiring I will switch between archaeology, architecture and information technology more often than necessary.

Four interpretations of Breughel's Tower of Babylon

For my illustrations I like the Tower of Babylon by Pieter Breughel, the most famous of such paintings, which can be armired in the Vienna Museum of Fine Arts. A reproduction of this painting I had placed in the development room of my fully transistorized pioneer computer Mailüfterl, and in the conference room of the IBM Laboratory Vienna there was a special black and white big size photograph of this painting. It had three succeeding meanings to which I want to add a fourth today.

I have selected this painting because of the poor people houses which in contrast to the tower itself are "operational"; they represent in my mind the failures and weaknesses which occur in every big enterprise and were intended to remind my collaborators of the human imperfection which no enterprise can fully avoid.

The second interpretation came along internationally including pictures of the tower in computer journals and books, the Babylonian confusion in the programming languages which the bible presents as intrinsic: God needs hardly a look an the tower and does not, like in other cases, discuss with the concerned people a compromise the confusion is a logical consequence. And so it is with computers. Programming languages adapt algebra to computers, and since computers and their applications continuously change, there is an infinite need for new programming languages.



Rekonstruktion des Turmes von Breughel: The computer permits to complete the unfinished tower. Maybe the top is open - several ideas are shown

The third interpretation goes into systems design. Why does one feel when looking at the painting that the catastrophe is close? Very obviously the design is visible, the completion of the execution is merely a matter of time. Breughel has put something else into his description to carry the catastrophe message to the thoughtful receiver. The painting tells us that confusion is not a problem of design but of management. He made his work in addition a state of the art report of construction execution tools for big buildings in 1596. So he shows all the machinery in use at this time down to work by hands. Therefore all cranes are different and there is little matching between the different crews. One can feel that there is mismanagement, and with the knowledge of the bible in mind the painting predicts the soon end of the enterprise. Weak management of giant enterprises is sufficient for dispersion. You will easily find examples of our time.

The fourth interpretation of Breughel's Tower, the interpretation towards your field is a kind of virtual archaeology, the completion of Breughel's tower by computing tricks. Missing and damaged details can be taken over from completed details. That there still may be open points I want to exemplify by several roof proposals, some of them clearly only a joke, but an enlightening joke. This shows the archaeologist as a retrospective architect and an information engineer; his intention is to re-construct and he does so by applying the information he has found to imagine the incomplete as the whole. Here I need the distinction between information and redundancy.

Information and Redundancy: Notions of the 20th century

Like Norbert Wieners Extrapolation Theory, Claude Shannon's "Information Theory" (Shannon 1948, Shannon and Weaver 1948) being in fact a theory of the channel capacity - is of little value for archaeology and computers. But the pair of notions activated by Shannon is very helpful: the pair information and redundancy, surprise and boredom, new knowledge and what one knows already. Between the two notions is a tension, a subjective tension because not everyone knows the same, a tension important for arts and architecture in particular. As seen by an information scientist, archaeology is a fascinating game between information and redundancy, between surprise and completion or repetition, but a difficult game requiring an immense amount of context information.

First a look into the kinds of information one has to deal with. In my university lectures, I propose to distinguish five kinds of it:

compelling information:
alarms
delivered information:
    a result that had been aimed at or ordered
provided information:
    ready to be called of, prepared in bigger amounts
shielded Information:
    made invisible for the user, accessible for the service specialist
locked information:
    personal and therefore protected.

For archaeology these five kinds may be proposed slightly differently:

obliging information:
    information about new findings
delivered information:
    excavation reports
provided information:
    the pre knowledge of the archaeologist
shielded information:
    yet undiscovered, unexcavated parts
locked information:
    inexplicable parts where so far the professional knowledge
    still waits for explanation

Programmed Processing - The Computer

The computer is not as trivial as its popular omnipresence suggests. And the computer is much more than a calculating device. Certainly this is how the computer its career. And since we had the watch guard mathematician, the fast development of computing went also perfectly smoothly. When you use it today, small calculations are easily inserted and large ones can be professionally executed.

Secondly, the computer certainly is the typewriter as which it appears and it is almost true that you get printed what you see an the screen. Namely: if you stay within the 26 letter the ten decadic numbers and the few other standardized symbols. Using a German "Umlaut" or a Greek letter is at your own risk, in particular if you transmit via the internet.

Apart from such minor weaknesses, the computer is a miraculous writing and storage device and has revolutionized printing. Every PC owner has become (and is sometimes forced to be) editor and press director.

Third: The computer is an organized beginning with inventory and going up beyond the system of airline systems. If your reservation and ticket scientist sits before an unwilling computer you have no chance. With your PC you have not only a dynamic address list, it also prints your envelope.

The collection of telephone books in your main post office is outdated by a much more complete and fluently updated internet access provided you know to handle it.

Four: Generally speaking the computer is a Silicium model which can be programmed to be any formal model you invent. If you design a model of intelligence or a model of satisfaction, you can have an intelligent and satisfied computer. If you really understand intelligence and satisfaction, you will know that there can be no realistic model for intelligence and satisfaction and you will refrain from a bad use of language. You will respect the limitations inherent to the notion of model.

But you have got in the computer a magnificent tool and archaeology has since a long time recognized its potential. It is not my task here to give here the certainly extremely interesting history of computer application in your field. Already the early big computers have been used in the reconstruction rebuilding of temples in Egypt. And of the present day application you know more than I do.

The Theory of Architecture

There is no reason to create a new theory of architecture: Vitruvius, the architect of the time of Julius Caesar and Augustus, has done that 2000 ago, and he did it so outstanding and generally that its application to computers and computer systems (Vitruv). He points out in detail how far the education of an architect should go. That I can not present here, but I will describe what Vitruvius considered good architecture because this has a close relationship to archaeology. Should you have interest and time: I suggest to read his first book.

What ever is designed or built has its architecture. But if the term occurs somewhere, one first thinks of the achievement of an architect: excellent design work. Clearly not all architects deliver excellent architectures; since I have studied the first book of Vitruvius, I look very critically on all modern architecture that comes before my eyes. Have they indeed read Vitruvius?

Conform to Vitruvius, the main properties of good architecture are

order: measure and proportion
arrangement: structure
eurhythmy: beauty and fitness
symmetry: agreement and matching of the components
(that is not symmetry in the geometrical sense)
propriety: conform to the elected principles
completeness: do not leave holes;
select the most general of what you include
clarity: do not complicate what can be done and said simply
orthogonality: do not interweave what is independent by nature
generality: do not restrict concepts, principles and features
more than necessary
economy: proper management of materials and sites,
(today we would add: energy and information), that includes the next keywords.
efficiency: do not waste material, energy and information
security: aim at resistance against distortions, failures and misuse
safety: no danger for environment and people in particular

I said that in the reconstruction process, the archaeologist becomes a retrospective architect like the group mentioned above who had to find out the function of the found Radar equipment. He builds up from the excavated remainders and from his historic, archaeological and general knowledge a picture, a model, a description, an imagination of the treated object. He tries to do this in the spirit of the original architect, who designed and built up the object when it was created. Finally he documents his findings and here he becomes an architect on a second level: an architect of the documentation.

One might raise the question how far the standards for elaboration and documentation should go.

Through centuries the information base of archaeology was a combination of excavation reports and library entries. The reports came then also into the libraries, and this combination, apart from history and cultural history, constituted the knowledge base.

The possibilities of information technology, memory capacity and global network formation, make information technology a new partner aside of the library, complementing it. Advantages and disadvantages of the new partner, of the medium computer, should be carefully considered before archaeology goes into the abstraction of the computer world

In the real life one typewriter after the other is replaced by a PC, and it is very practical to interconnect all of them by the internet. These are no conspicuous steps and except certain budgetary quarrels there are no objections, no obstacles. Maybe one or the other in the staff participate in a computer course, learns the required programming language.

One starts off with the authors known from the library and generalizes, using search machines. In short, in fact you all are already in our computer world. Considered precisely this is not yet really a truly scientific methodology, but it is generally accepted: other professions do not advance differently.

In fact, one could do better. But for this a particular effort is necessary and I propose one to you.

An Information Processing Competence Center

A Proposal for Archaeology and Other Fields

A study group "how to best use information technology for archaeology?" might not be a bad idea. One of its tasks would be the organization of an archaeology oriented database of history. I am sure that a lot can be found in the internet. But how reliable are the different entries? Is there any institution that checks correctness or qualifies contributors? Only the "local" specialist can evaluate the entries. As any other field you would need a generally accepted hard core distinguished from proposed addenda that are admitted but require further elaboration. And this system requires a firewall outside of which all the other, unchecked entries live.

It would be great to have a search machine which indicates for each finding to which of the three mentioned categories it belongs. The secret here is the proper selection of search key words.
It might be possible to organize this competence center as an institute, but information technology permits you a distributed solution, a center composed by sections of existing institutes. What you then need are organization and operation rules.

Actually what I have proposed here for archaeology is a structuring in the internet which would be required far more generally. But this is another story. A much more difficult one at least.

The Notion of Interface

I turn to a concept of information technology which also may be helpful here. For the investigation of an information system a suited or implied spot is selected and there a cut is applied, in reality or merely virtually, so that a look or a measurement can be made in either direction. From the measurement (or a calculation) it might be possible to conclude whether left and right are fitting or not. If not, an adjustment device may be necessary.

If the two sides of the system communicate the question arises in which language, in which code they do so or they should do it. Before the computer time that was a human problem now it becomes more and more a technical issue.

If one of the two sides is human (the user or the human "caretaker"), one faces a so called "man-machine-problem".

Man is distinguished from machine by more elementary features than most engineers think. He can adapt to machine-like behaviour but this is recommendable only in exceptional cases; normally the difference must be carefully considered in the design. The archaeologist faces a man-artefact situation and here is the analogy to the information system situation.

It might be worthwhile for the archaeologist to consider the interface between him and the object he is working on: there are models of behaviour - different ones depending of the situation, e.g. whether the object is

in existence
under design or
under reconstruction

And this invites us to consider again the steps of archaeology

Discovery, Search

something was found	coordination
how far does it reach?	extension explored

Excavation

cleaning separation of waste

Interpretation

what was it, what purpose did it have?	dynamics out of static reconstruction
how did it look when it was in order?	completion, extension

Application of Architectural Design

Architectural Design is not only required for the object as such, it is applied trifled:

to the object
to its production
to its documentation

To the documentation of archaeological work and to publication in general, I may make a few special comments. I have written more than 500 papers and I have read several thousands, many of them for evaluation. How to design a document or a publication is an art that would deserve to be the subject of a one Semester lecture for any kind of study. The main advice I can give is to spend a considerable fraction of the time for layout and list of contents (Zemanek 1980 and 1986).
One modern addendum to Vitruvius' keyword "clarity" is: be careful with abbreviations. Do not use them more than readability requires. Never use them unless they are explained in your text, in the copy or book. And in no case have an abbreviation in the title of your paper.

An opera without an overture is incomplete. The listener is not as "in" as the composer and the performing artists. He must be brought by musical means to the point where the action starts. And the same is true for any publication. Most of them neglect this. What is the prehistory of the general and of the particular subject, what is the prehistory and the view of the author?

If one documents a situation, if one writes a paper, the consideration of the architecture of the writer's product can be extremely helpful for the acceptance of the product. Has the text the right structure and the best headlines? Many such questions should be raised before giving the manuscript out of hands, before sending the document to the recipient.

An Other Distinction of Information

If one looks at the different sorts of information one sees (for instance)

1) structure information concerning the general arrangement of the parts
2) repetition information concerning typical ingredients of the design which are applied many times; important for the economy of the production
3) exception information concerning ingredients that are used one once or repeated ingredients with important deviations

That repetition information is important for the economy of architectural design is shown by the example of the Sydney Opera House. There the architect had to be dismissed because he preferred individual elements to repeated, to equal elements which correspondingly had to be fabricated individually. The budget exploded, not by the usual 25 or 30 %, but by a factor of 3 or 4. The successor was obliged by the town to use construction elements (the many bows for instance) in standard sizes so that they could be produced by few standard procedures and casting forms.

How far such considerations are valuable for archaeology and its reconstructions, is on you to judge. What I show are consideration or examples how the archaeologist can apply ideas of information technology and of architecture to his work.

3D Models, Static and Dynamic

I believe that such models are extremely helpful, not only for average visitor but also for the specialist. And here modern information technology can be of extreme service as two examples show.

The computer is a model designed for designing models.

To extend the drawing to a three dimensional model is an offer of information technology to archaeology which can be made very valuable. Because with all due respect for imagination, it is far more efficient to support the imagination of the third dimension by a model of three dimensions.

I had to evaluate such a project at the 2001 meeting of the European IST (Information Society Technologies) Prize. The project is called "Fastbuilder" and developed by the IWI Group. The subject is a three dimensional modelling tool that programs cities from maps, picture postcards, aerial views and so on. Once the model is established, one can order a certain point in the city, a height and a direction, and the program delivers a picture of the city from this point in the ordered direction.

One of the sponsors of this event is the Autodesk GmbH in Munich and in the last issue of the journal of the Austrian Electrotechnical Society this company reports its project called Munich 4D (AutoDesk 2003), simulating 400 years of the building history of the environment of the Frauenkirche and of the Karlspatz (Stachus).

The Future of Information Processing

The drive of information processing offering more and more services for a steadily sinking price makes information technology an extremely valuable tool for archaeology. And therefore it seems appropriate to conclude with a look into the future of information processing, in particular to the features of value for archaeology.

I expect for the coming decades an extension of processing to teleprocessing. What I mean is this: when you dial today from one place to another, maybe over the ocean what you trigger is an action an the other place: a switching device interconnects you conform to your instruction, namely the dialled number, to your wanted subscriber. It is easy to imagine such telecommanded processes for all kinds of purposes. The realization is in so far less easy as the execution requires a standardized code for standardized production or execution lines. And it will also need a sophisticated protection against misuse. So it will take still some time until it becomes clear in which ways such possibilities can be used successfully and economically. But I am sure that teleprocessing of material and energy will come. And archaeology will have to consider how their solutions may look like.

Already for the usual information processing one is well advised to strive for common application of advanced programs for each field of application. I therefore think that the advice I gave above to archaeology should be given to any profession: establish a competence center for the particular needs of your field, collect methods, programs and data and take care of the biggest enemy of progress: progress, progress which paralyzes prior achievements.

The main example is storage. By improvement of storage technology progress makes older carriers unreadable, their information inaccessible. It becomes necessary to translate the information from the old system to a new one. Since we collect more and more information, the costs for this translation are not going down as they do for a constant amount of information they go up. The competence center can watch the development and advise national institutions how to equip their computers software wise and can assist in the storage problems.

To this situation I tell you my closing story, not out of archaeology but out of arctic or Antarctic exploration. It was found that the administration of stored exploration results had destroyed a substantial fraction of twenty years old expedition reports. The director was heavily accused. In defen-

ce, he gave a proof that it was much less costly to repeat in certain cases an exhibition rather than to keep the complete material in storage.

This may have been before our electronic storage facilities. But somehow the story is beyond history. To store or not to store it may sound strange but it may become your question.

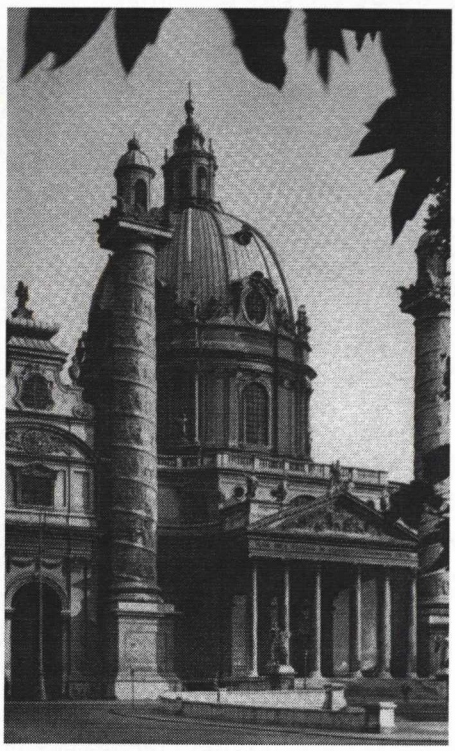
The speed by which the computer hardware (processor and storage) improves its parameters is as well a big chance as a heavy danger for the field of information technology, for the individual and for institutions and companies. Be enthusiastic about the chances which information technology offers you, but be also warned: the computer not only demands more discipline than can be brought up - our technology may tear you in directions you better do not take. Tools are helpful in the right hands and for the right mind.

ATTACHEMENT

As a kind of post-scriptum I want to add a few comments on Stonehenge and alignments.

Stonehenge is a perfect example for archaeological reconstruction, beginning with the question of the purpose of the site. It was with computer help that a thorough investigation of all possible alignments was carried out and the results were considered very meaningful (Hawkins 1965, Zemanek 1978). This study shows how valuable the consideration of alignments can be and the application of computer programs on found data is also remarkable.

The other two comments concern Baroque buildings, architectures still in use. One is the church of St. Charles in Vienna, a masterpiece (even a lecture in architecture) by Fischer von Erlach (who, by the way, was one of the earliest theoretical archaeologists: he reconstructed ancient buildings and the volume with his results is an admirable collection of early examples of reconstruction).



Karlskirche, Vienna, Austria

My late friend, the architect Dr. Hans Foramitti - he had, by the way, discovered Fischer von Erlach's volume in our Paris time (1948) at a bouquinist along the Seine river, bought it for a price affordable for a student, and brought it to Vienna in his rucksack - found out that the statue of St. Charles over the portal of the Vienna church gets a "holy shine" by alignment: if one takes the right position (difficult today because of the pond added a few years ago, but possible in winter time when the pond is empty) there is a front window of the lower set in line with a back window of the upper set and around the head of St. Charles is an aureole, a nimbus (moreover one of the windows necessary for the alignment has been covered for a certain purpose so that the effect did not work lately).

A different effect exists in the church of the Abbey of Melk (about 100 km West of Vienna, on the Danube). If one goes there around the day of St. Peter and St. Paul - 29 June - at 6 pm local time, i.e. 5 pm summer time - the sun rays through the back window illuminate precisely the statues of the two saint on the main altar (This I have discovered myself and published a photo in the local newspaper).

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