
EDITORIAL

European Computer Science Market

There have been good working relations between CWI, GMD and INRIA for quite some time. However, emerging from many opportunities to meet and work together, our three organizations have now entered a new era of scientific cooperation. Why is this step so important at this particular moment in time?

First of all, our cooperation has matured on the basis of many personal long-term contacts at formal but also at informal levels.

Secondly, science and research have become a driving force for economic growth and for social concern in terms of key technologies like computer science and information technology.

Thirdly, there is an urgent need for cooperation in view of a forthcoming European market requiring combined efforts from all our organizations in order to be able to meet the opportunities and challenges of such a new dynamic environment.

In view of this development, our three organizations can achieve more and can intensify their scientific contribution in Europe by combin-

ing their resources and by focussing on joint strategies and actions which may shape the quality of future research in information technology in a more global market environment.

After several successful meetings of our managers and researchers, a policy document and joint action programme for the forthcoming years were adopted.

The scope of our cooperation will therefore be:

- to further develop computer science as a key technology,
- to orchestrate research projects which supplement each other in such a way that more research areas can be covered and others can be studied more intensively,
- to make contributions for shaping future European research programmes.

As a further result of our discussions we have articulated our intentions in a joint policy paper and have concentrated our efforts on a joint action programme comprising memoranda and policy statements, scientific workshops, a scholarship programme, an advanced training

programme and a joint newsletter of which we here introduce the first issue.

As our recent workshops on November 17-18, 1988 at CWI in Amsterdam on scientific computing, programming and man-machine communication clearly demonstrated, there is a great enthusiasm among our researchers for working closer together, exchanging ideas on a regular basis and having researchers exchanged across project lines among the three organizations.

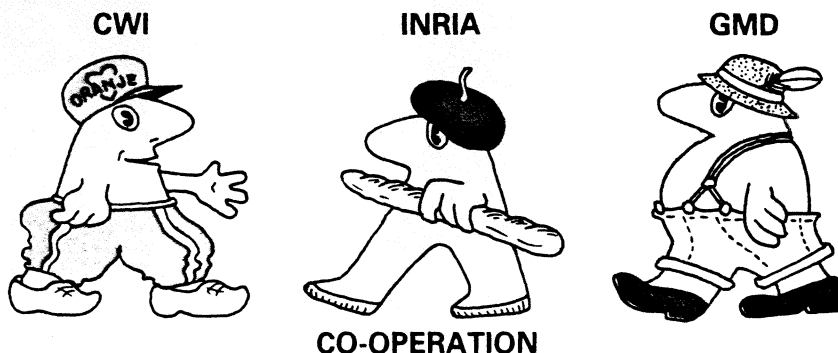
We believe that our joint initiative has established the framework which will keep up the momentum of this enthusiasm and sharpen our awareness for the benefits of a closer cooperation. It will provide the opportunity for all of us to serve the scientific community and our economies better.

Besides, we would like to point out that we also consider the effort of our three organizations as an invitation to other computer science and information technology research centres in Europe to join us in our venture.

May this newsletter be one of our major channels through which we communicate with each other on our efforts, strategies, approaches and achievements, but also on our problems and questions.

In this respect, we invite our researchers to use our newsletter to communicate and to learn from each other. Contributions from all researchers are most welcome and worth the effort. We hope that this newsletter will be well received by our scientists and by a wider readership interested in our approach and our field of science.

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CWI GMD INRIA Newsletter

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COOPERATION

First Meeting in Amsterdam: the National Research Centres of France, the Netherlands and the Federal Republic of Germany Intensify Their Cooperation

The staffs and directors of the National Research Centres for computer science and information technology of France, the Netherlands and the Federal Republic of Germany have decided to intensify cooperation, to conduct coordinated research work pursuing jointly defined activities and to exchange findings and results on a regular basis. This will increase the efficiency of research activities and improve the quality of their outcome. This is also to enable the scientific community of the twelve EC countries to assume its due rank in the key area of computer science and information technology. These are the most important results of a meeting held in Amsterdam from 17th to 18th November, 1988. This meeting gathered more than 100 computer scientists and managers from the Centrum voor Wiskunde en Informatica (CWI),

Amsterdam, the Institut National de Recherche en Informatique et en Automatique (INRIA), Rocquencourt near Paris, and the Gesellschaft für Mathematik und Datenverarbeitung mbH (GMD), Sankt Augustin. CWI, INRIA and GMD intend to formulate principles, ways and means as well as strategic goals in a joint policy paper to be completed in the spring of 1989.

The three organizations intend to identify such research areas of computer science and information technology which require special efforts in Europe. Furthermore, the three Centres are prepared to help in the formulation of EC research programmes. They are open to the participation of further comparable institutions from other EC countries.

In the past years, information technology has more and more become a key technology. In the competition with the United States of America and Japan, the European countries will be able to keep up the better, the more their research activities are coordinated, their resources are combined and duplicate work is avoided. This will facilitate the attainment of joint strategic goals without dissipating the scientific



Dutch, French and German computer scientists at CWI, Amsterdam.

Photo by Dik Zwarst

power. Top level quality is also the expected outcome of the joint efforts.

In view of the growing unity of Europe, cultural and scientific interests of the EC countries will have to consider increasingly European criteria. The academics working in the three National Research Centres anticipate this development even today by trying to define their various research programmes from the viewpoint of the possible future goals of a European research policy.

Therefore, the academics of the three organizations will in future be primarily concerned with those research areas which are of special importance to Europe, i.e. basic research in computer science, information technology and mathematics as well as development projects and applications with partners from industry or universities and other institutions.

For this purpose, full use is to be made of the special facilities and advantages provided by the three National Research Centres. In addition, experts of the three organizations will work on the development of a new European research programme and make relevant suggestions to the governments.

First measures of a European cooperation have already been put into practice during the meeting in Amsterdam where researchers exchanged their findings in three workshops. Scientific computing, theoretical and pragmatical problems of programming and man-machine communication were the topics discussed.

Further activities will follow, e.g. a joint workshop on the topic of parallel processing. An exchange of experience with the European Research Programme ES-PRIT is planned. Findings in the research fields of software engineering and systems engineering are to be discussed. The directors of the three centres discussed a possible scholarship and advanced training programme for post-graduates. A joint newsletter

is to inform the personnel of the three centres of the research activities and important events in the other partner organizations, on the one hand, and to present an outline of the "European Research Triangle" to the interested public, on the other. A second meeting is to be held at GMD in Sankt Augustin on the 13th and 14th April, 1989.

The Netherlands: Centrum voor Wiskunde en Informatica

The Centrum voor Wiskunde en Informatica (Center for Mathematics and Computer Science, CWI) is the research institute of the Stichting Mathematisch Centrum (SMC). SMC operates within the Netherlands Organization for the Advancement of Research (NWO). Funding depends on NWO financing and on external means. The long-term aim is to ensure a 2:1 balance in these forms of financial support. CWI policy is based on a principle stated already in the founding statute of 1946, i.e. to foster the systematic pursuit of pure and applied mathematics, including computer science (which was at that time not considered as a separate discipline). Three essential elements in the current policy plan are: carrying out excellent research primarily involving fundamental (pure scientific and application-oriented) research; knowledge transfer and expert training for the (academic) research sector, industry and government agencies; positioning CWI as a national and international meeting point for researchers. At present, 270 people are working at CWI, of which about 180 researchers.

CWI has six scientific departments: three in mathematics and three in computer science, with the following priorities of the research programme:

- Algebra, analysis and geometry (discrete mathematics and

- computer algebra, analysis on semisimple Lie groups and symmetric spaces, dynamical systems, asymptotics, algebraic mathematical physics, nonlinear analysis and biomathematics, image processing and reconstruction).

- Operations research, statistics, probability and system theory (combinatorial optimization, analysis and control of information flows in networks, system and control theory, stochastic processes, semiparametric statistics, image analysis)

- Numerical mathematics (discretization of evolution problems, steady boundary-value problems, numerical software).

- Algorithmics and architecture (algorithms and complexity, distributed systems, computer systems and ergonomics, distributed adaptive information systems, constructive algorithmics, cryptology).

- Software technology (concurrency, formal specification methods, extensible programming environments, term rewriting systems, expert systems, logical aspects of artificial intelligence).

- Interactive systems (computer graphics, user interfaces, dialogue programming, intelligent CAD systems, user-controlled systems).

Moreover, the Department of Computer Systems and Telematics recently started a research programme on networked document retrieval and manipulation, internet/ISO protocol development and network-based job entry and performance monitoring.

Federal Republic of Germany: Gesellschaft für Mathematik und Datenverarbeitung mbH (GMD)

The Gesellschaft für Mathematik und Datenverarbeitung mbH (GMD) is the German National

Research Centre for Computer Science, mainly funded by the Federal Government and the State Governments of the Federal Republic of Germany with additional financing of approximately one third from cooperation and project agreements. The tasks of the GMD include research and development in the fields of computer science and information technology, in the field of mathematics relevant to these and in the area of technical and scientific information systems. The GMD headquarters and most of its institutes and departments are located in Sankt Augustin near Bonn. In addition, GMD runs institutes and research departments in Berlin, Bonn, Cologne, Darmstadt and Karlsruhe as well as offices in Tokyo, Washington and Berkeley. Founded in 1968, GMD has now a staff of 1400, about 1000 of them being academics.

The scientific work conducted in the six institutes and five research departments is focussed on:

- research on methodological principles for the design and use of information systems,
- design and architecture of hardware, netware and software components and systems,
- methods and tools for the design of very large scale integrated circuits,
- development of knowledge-based computer systems for supporting knowledge workers in offices and organizations,
- future-oriented integrated information and publication systems,
- legal and economic problems of using information technology.

France:
**Institut National de
 Recherche en Informatique
 et en Automatique**

The National Institute for Research in Computer Science and Automation (INRIA), a public-sector scientific and technologi-

cal institute, is under the responsibility of the French ministries of Research and Industry. Headquartered at Rocquencourt near Versailles, INRIA has four research centers at Rocquencourt, Sophia-Antipolis, Rennes and Nancy.

INRIA's activities in information processing and automation encompass basic and applied research, design of experimental system, technology transfer, knowledge transfer, international scientific exchanges, cooperative international programs, maintenance of scientific expertise and standardization.

Among 1000 employees carrying out these activities are 600 scientists, the group that includes 250 fulltime researchers, 40 industrial engineers, 75 researchers from government laboratories, 45 foreign scientists and 200 students and trainees.

The institute's budget for 1989 is 360 million french francs, more than 20% of which is to be derived from contracts, royalties and sales.

The computer facilities of INRIA consist of more than 150 microcomputers, more than 200 UNIX workstations connected to local networks, more than 15 minicomputers and 2 mainframes (Bull Multics and Gould 9080). The institute also has access to a Cray II computer.

The research carried out at INRIA is mainly concerned with software and automation engineering; the institute contributes to the development of the most advanced techniques both in the data processing industry and on a wider scale in related sectors. This research brings together experts from the fields of mathematics, automation and computer science within more than 60 teams distributed in 8 programs:

- Programming, symbolic computation and artificial intelligence,
- System architecture,
- Networks and distributed systems,

- Data bases,
- Automation, production automation, data and signal processing,
- Robotics, image and vision,
- Scientific computation, computer aided engineering,
- Man-machine communication.

RESEARCH ACTIVITIES

Factoring large numbers

CWI - A 100-digit number, known to have no small prime divisors, was factorized last October into two prime factors, an achievement good for frontpage news in The New York Times. Project leaders Arjen K. Lenstra (Univ. of Chicago) and Mark S. Manasse (DEC, Palo Alto) approached the problem as a massively parallel computation by combining the power of 400 computers (mainly SUN workstations and micro-VAXes) in 12 research centres in the USA, Europe and Australia, among which CWI in Amsterdam. Partial results were automatically sent by electronic mail to Palo Alto and subsequently processed there. Lenstra and Manasse used the Quadratic Sieve Method, devised by Carl Pomerance (University of Georgia) in the early 1980's. The next target in the project is the factorization of a 106-digit number, expected to be accomplished this Spring. These results are relevant for the security of public-key cryptosystems like the most widely used RSA system. CWI has quite some experience in this field and holds the world record for factoring large numbers on a uniprocessor computer (a 92-digit number factorized last April on a NEC SX/2 supercomputer).

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The Assisting Computer – Research for a New Generation of Office Systems

GMD - In the office of tomorrow, the computer is to be used as a 'personal assisting machine' for people. Today's personal computers do not yet fulfill what their name promises. A really personal support should consider the specific task domain and the work style of the individual. What users require are 'Assisting Computers (AC)' which are adaptable to their needs and habits.

Currently GMD is planning its activities for the 90s. The Assisting Computer will certainly be one of the key projects to be conducted. The vision is a completely new generation of information technology based office systems whose service provision is adapted to the abilities and properties characterizing good human assistants without claiming to replace them.

The GMD experts design the Assisting Computer for knowledge workers, e.g. planners, managers, engineers or researchers, and to do so they try to learn as much as possible about the way in which human assistants provide their services.

The immediate support of creative activities by information technology involves many problems to be tackled by computer scientists. Research into many services to be provided by such support systems is already under way but their implementation is still far from being realized. Many performance and quality characteristics must still be defined precisely and developed.

Furthermore, with increasing independence of the computer in task accomplishment, research should also be increasingly concerned with the question for the limits of such a development. In any case, the responsibility for tasks delegated to the computer should lie with people. How to

achieve this is to be investigated. In any case, the comparison with the human assistant should be applicable: in the end, control and responsibility lie with the superior and not with the assistant.

It is the aim of the Assisting Computer development to design an ensemble of support systems to be handled by the user in a uniform or at least similar way. The GMD experts divided the machine assistants roughly into three groups:

- the universal office assistant fulfilling general office functions,

- the domain assistant which is specifically tailored to the respective occupational group.

- the communication assistant supporting the knowledge worker in communicating with other persons within or outside the local organization.

The project will focus on distributed problem solving, automated planning and configuring, man-machine communication, knowledge representation and knowledge acquisition. Completely new computer support services will result from the first two areas; the activities in man-machine communication shall advance the quality of cooperative interfaces; the basis of the system will be new findings in knowledge representation and acquisition without which the overall goals of the project cannot be realized.

If we consider the volume of the tasks to be accomplished, it is not surprising that it is a long-term project with a time horizon of more than ten years.

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INRIA – GMD – ISO LISP

INRIA - INRIA and GMD participate in the project European Lisp System, which has been accepted as an Eureka Project at the Eureka Conference in Madrid

on the 15th September 1987. The other participant is ILOG, the subsidiary of INRIA and CRIL, a French company specialized in Artificial Intelligence.

The project arose from the realization that:

- there is at the present time no strong European convergence of Lisp implementation,

- the European market is thus much dependent of the American trends and forces,

- there is no evidence that the present Common Lisp family of implementations ensures efficiency.

The objectives within the context of this project are to create a Lisp environment conforming to the ISO standard and offering the following features:

- efficiency of execution in interpreted and compiled modes,

- total portability of both the language and the applications written with it,

- simultaneous availability on most frequently used scientific computers by Lisps all over the world,

- integration of high-level concepts (high-level error trapping, object oriented mechanisms, ...) at the level of the kernel of the system,

- extensibility (which was one of the strong points of LE-LISP),

- access to the advanced environment functions of modern scientific workstations,

- self-explainability and integrated tutorial package.

In order to achieve those results, the strategy of the project will be as follows:

- use as starting point a kernel written in Lisp itself, augmented with the instruction set of a virtual machine taking into account the desired kernel-level features wanted. A Lisp compiler will be used to translate the kernel Lisp code into the sole language of the virtual machine.

- port the virtual machine and the kernel on the development machines of the partners, thus ensuring at an early stage of the pro-

ject the portability of the final system and providing a common basis for further developments,

- develop the High-Level Lisp environment mentioned above,
- provide ad-hoc transport tools as well as a validation kit,
- transport the whole system on a wide range of scientific computers, thus ensuring an immediate availability of the system for most Lisp users.

A special attention will be paid to "ISO-LISP" compatibility issues and efficiency considerations during all the project.

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Multigrid for Hermes

CWI - CWI's research project Multigrid for Hermes, carried out in the framework of the aerothermodynamics programme of Avions Marcel Dassault - Bréguet Aviation, started mid-1987. After finishing the documentation of earlier work on the basic multigrid method for the solution of the steady Euler equations and giving a survey on multigrid methods, the steady Euler method was extended to a steady full Navier-Stokes method and successfully applied to some typical Navier-Stokes problems. This extension influenced both the discretization and the solution method.

In 1988 a further convergence improvement and the extension to hypersonic speeds were investigated. For better convergence, the collective point relaxation method was replaced by collective line relaxation. For Euler flow computations this appears to lead to a more efficient multigrid technique, whereas for Navier-Stokes it leads to a greater robustness. In hypersonic Euler flow computations we developed a switched-relaxation-evolution

technique against a failing Newton iteration.

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TeleTrusT - Trustworthy Electronic Communication

GMD - The aim of the GMD project TeleTrusT is the trustworthy electronic communication. In cooperation with the software house mbp, Dortmund, GMD succeeded in improving the security of teletex communication. The outcome of the project is a product called TELETEX-CRYPT by mbp. It is easy to install on available personal computers and provides the following features:

- It enables the user to put an electronic signature to teletex documents thus establishing the authorship and intactness of the document beyond doubt.

- Teletex documents can be encrypted to secure the confidentiality required for the communication of sensitive data.

The teletex service is specifically tailored to the requirements of electronic business correspondence. Its characteristics are rapid data communication, reliable transmission, extensive character set and original layout. TeleTrusT will add further characteristics, i.e. functions that are required for the trustworthy electronic communication.

TeleTrusT helps avoid the following risks:

- Electronic documents can be faked or distorted. Without the sender being aware of it, the recipient can modify an electronic letter after receipt and pretend that it is the received original. Even the sender him/herself can modify his/her copy and pretend that it is the very version sent to the recipient.

- The authorship can be denied. The sender can pretend that s/he has never sent a letter. Somebody else must have done it using

the name of the pretended sender. In this way, the sender could try to cancel a concluded contract (e.g. an order).

- The authorship can be faked. The letter can show the signature of a third party not being aware of the letter. Thus, the actual sender wears the mask of somebody s/he pretends to be.

- Data can be spied out. During the transport from the sender to the recipient, information can be accessed and copied by unauthorized persons. The term 'transport' refers not only to the transmission line, but also to the involved data terminal and transfer equipment.

The TeleTrusT approach is based on the use of a public-key cryptosystem, the RSA algorithms named after the mathematicians Rivest, Shamir and Adleman. Within the cooperation with mbp, it was the task of GMD to make the mentioned cryptosystem practicable.

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BABYLON - the Tool System for Expert Systems

GMD - Computer scientists of the GMD Institute for Applied Information Technology have developed BABYLON, a tool system for expert systems. Currently an installation of the system on personal computers is under way. It will allow a universal use of the BABYLON method base. The expert system for investment counselling was presented as first large expert system on the IBM AT version of BABYLON. The IBM AT version is the first of a number of BABYLON installations on personal computers and workstations which show identical program code.

Many tools to be used for constructing expert systems provide a fixed set of formalisms and can-

not be adapted to user requirements thus revealing their restrictions very soon: the tools cannot be tailored to the problem.

Today most expert systems tools are developed on special-purpose computers and have to be used on those computers although often not compatible with the user's current computing environment. Available software cannot be integrated and the tools and systems developed with their aid are thus not accepted.

What the user needs, is a tool which already contains powerful formalisms, but which is also easily extensible. Only such a tool will allow an optimal adaptation of the system to user requirements. The tool should be portable to other computers without requiring a reimplementa-tion. This would allow the development of an expert system in an efficient environment and secure the use of the developed system on the desired hardware without requiring any modifications.

BABYLON is a hybrid tool system both for the design and the use of expert systems. It is a toolbox for configuring application-specific tools consisting of object-oriented Common-Lisp modules.

BABYLON provides full functionality and identical code in the interpreters on Symbolics, TI Explorer, Macintosh SE & II, IBM AT, Cadmus, EMS 58xx, MX 2 & 300 and VAX. Since three years, BABYLON has been evaluated and continuously extended for process control.

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GOTHIC

INRIA - In partnership with BULL S.A., INRIA has been working since May 1987 on the project GOTHIC. The aim of the project is the implementation of a 3rd generation system based on the application of the "nested atomic multifunction" concept

which generalizes the procedure concept. On the 14th of October 1988, the team conducted by Michel and Jean-Pierre Banâtre presented the hardware prototype to a delegation from BULL headed by G. Roucairol, in charge of Research at BULL France. This prototype allows a continuous back-up of a program execution; it is then applied for fault tolerant systems.

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EXPLORA - a System for the Interpretation of Data

GMD - Experts of many domains often complain about the intransparent abundance of numerical data and tables they are confronted with, not least due to computerization. A help is now provided by a new GMD development: EXPLORA, the prototype of a knowledge-based system for the exploration of figures.

This system tackles a problem knowledge workers of all domains are increasingly faced with. The available numerical data are too extensive and too poorly structured for a quick identification of the substantial information so that they are buried somewhere on the desk. The currently widespread standard program packages providing traditional statistical methods identify only formal structures since they do not consider the context the figures originate from. The new development intends to unbury those numerical data to use the relevant information they hide.

It is the explicit aim of the statistics interpreter EXPLORA to support directly the content- and domain-oriented interpretation of the data by the system. For this purpose, the system should be provided with application-specific knowledge from the domain

in question. The relevant context of the real system producing the data is therefore appropriately mapped onto the interpretation system. The terminology of the specific domain, the analysis objects, their properties and especially the goals of data analysis should be modelled in the statistics interpreter.

Systems of this type provide a completely new quality of support. They analyze the data to a greater extent than statistics systems do, they do not replace the human expert, but adapt their services to his/her requirements.

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KRITON Supports Knowledge Acquisition for Expert Systems

GMD - The efficient and widespread use of expert systems is considerably restricted by the lack of methods and theories for knowledge acquisition. The Research Group 'Expert Systems' of GMD is currently working on a new project to solve this problem. The system KRITON, named after an interlocutor of Sokrates, presents the first results of that work.

The most important questions KRITON is to help answer are as follows:

- How to gain knowledge for an expert system?
- How to avoid a subjective interpretation of the knowledge by the knowledge engineer?
- Which methods are suitable for supporting the life cycle of expert systems?
- How to make very large expert systems transparent?

Expert systems, in particular second generation systems, include a model of the expert's problem solving process in addition to the representation of the problem area. This model should not

be limited to a superficial comparison of input and output, but should be able to answer questions for the motivation of individual problem solving steps to make the results of the expert systems more credible.

The process of knowledge engineering is therefore concentrated on the modelling of the expert's problem solving process.

The knowledge engineer tries to provide the expert system with the expert's knowledge. Manuals and background literature is analyzed, the expert is interviewed and observed during his/her work.

The knowledge acquisition system KRITON supports the creation of expert systems by automating some of the tasks described above. This leads not only to an increase of efficiency and methodology, but it also avoids a wrong interpretation of the data by the knowledge engineer since the expert interacts immediately with the system, and the knowledge engineers acts only as a mediator between the expert and the acquisition system.

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L3 – a New GMD Operating System for the 90s

GMD - Based on advanced concepts, GMD experts have developed a new operating system: L3, a multi-user operating system, will meet the requirements for future-oriented micro-computer operating systems of the 90s.

With L3, GMD presents a unique microcomputer operating system. Operating systems have been gaining in importance since the advent of increasingly powerful microprocessors. The currently available operating systems cannot meet the requirements of advanced hardware. It is actually pure waste to use an op-

erating system which does not fully exploit the hardware, comparable to a racing car going on country roads.

The operating system L3, however, is quite different. It was specifically constructed for one of the most advanced components of a computer: the Intel processor 80386. It uses the full performance of the processor thus turning a personal computer into a machine which is available for several persons simultaneously. Such multi-user systems based on microprocessors will be most popular in the near future. Nevertheless, L3 also allows the integration of available software. Users who have worked to date on the most famous operating system for personal computers, i.e. MS-DOS, can use their software also under L3 enjoying all advantages of the new system. L3 will meet the operating system requirements for computers of this size far into the 90s. L3 is a breakthrough to a new era of micro-computers.

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Parallel Computation

CWI - Researchers into parallel computation should have the possibility to carry out experiments on real systems. Therefore, last November CWI purchased an Alliant FX/4, a shared-memory computer with four vector processors. It is used primarily for the investigation of coarse-grained parallelism in numerical algorithms, like those for solving the shallow-water equations and systems of linear equations. The idle time of the machine is spent on the solution of problems in computational number theory, like the factorization of large integers.

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SISAL – a Program for Computing Electronic Circuits

GMD - The computing of electronic circuits by mapping real behaviour onto a computer model, the so-called simulation, is steadily gaining in importance. Integrated circuit design would no longer be conceivable without this simulation since design errors have to be avoided as much as possible due to expensive and time-consuming prototype production. Also, inner-circuit measurements are very difficult in the case of integrated circuits.

Simulation is coming to dominate the experimental area more and more in the case of discrete circuits as well since a computer model is easily modifiable and the results are available more rapidly. Therefore, electrical simulation will also gain in importance in the case of non-integrated circuits. This applies, in particular, to the simulation of circuit behaviour in the time domain referred to as transient analysis. One of the main restrictions to a widespread use of the transient analysis is its high demand on computing time which may amount to several hours even for medium-sized circuits.

Based on work on integrated circuit design done in the project E.I.S., GMD has successfully developed and tested the experimental simulator SISAL. It was the aim to develop and test new methods which accelerate the process of the transient analysis on a computer. The basis was a recently developed method allowing a considerably more efficient computation for specific circuit types (MOS circuits). The simulator will be further developed in cooperation with CAD-LAB, a joint venture of Nixdorf and the University of Paderborn.

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VLSI-development

CWI - At CWI a new graphics processor is being designed and built, using submicron VLSI-technology. The chips will be part of an architecture which can generate images in terms of video output directly from 3-D object descriptions. As a result direct interaction with the visible 3-D objects is possible. The VLSI-techniques used could be classified as RISC technology applied to graphics. The first prototype with some of the chips running is expected by the end of 1989. Depending on the experience with this first in-house VLSI-project, several other VLSI-based systems are envisaged. VLSI-based implementations are excellent candidates for joint projects, not only because of the costs involved, but also because of the easily manageable project structuring. CWI is quite interested in such cooperations.

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JOINT ACTIVITIES

Foundation of the International Computer Science Institute in Berkeley

GMD - In future US and German computer scientists will be able to cooperate within the new International Computer Science Institute (ICSI) founded at the famous University of Berkeley, USA.

This research institute, which was opened officially on September 27, 1988, is to provide an innovative and competitive environment for research activities which will be of benefit to German universities, research institutions and industry.

The Institute shall facilitate

- the cooperation of top scientists of the two countries,
- an extensive information transfer and the use of research and development results obtained in the United States;
- the return of German top scientists working in the United States;
- the advanced education of German junior scientists.

The location at the University of Berkeley allows a close cooperation with the University's Computer Science Department which will certainly stimulate to research activities yielding outstanding results and accelerate their implementation.

In the near future, the research activities of ICSI will concentrate on artificial intelligence and computer theory. It is intended to create the foundations for developing new structures for computer systems consisting of a multitude of processors. Three teams are to be concerned with this subject. The first team will study the theory, the second team the scientific application to artificial intelligence and the third team will be concerned with the realization of such computer systems of massive parallelism. Further aspects to be investigated are data bases for robotics and very large computer networks.

The research projects are to be funded both by US and German bodies. In the Federal Republic of Germany, a group of sponsors was established. Together with the Federal Ministry for Research and Technology, this group intends to pay about 6 million marks per year. The members of the group are GMD, Daimler Benz, Bertelsmann, Krupp, Mannesmann and Siemens as well as the President of the German Patent Office, Dr. Erich Häußler.

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COMETT

INRIA - In the framework of the EEC project COMETT, INRIA has been charged by the EEC for the organization of a European version of a course on "symbolic computation". The first edition of that course was organized by INRIA at Sophia Antipolis.

Please contact: Michel Bernadou
+(1) 39 63 54 32

GMD Computing Centre is Central Node of the European Academic and Research Network (EARN)

GMD - A box of desk size located in the GMD computing centre in Bonn handles the major part of the electronic communication between academics of the Federal Republic of Germany and their colleagues all over the world: a medium-scale DP system, i.e. an IBM 4361, is the German central node of the European Academic and Research Network (EARN) and, in future, of the German Research Network (DFN). The German EARN node (DEARN) was moved from the Gesellschaft für Schwerionenforschung mbH (GSI) in Darmstadt to the GMD computing centre in Bonn.

With the installation of the EARN central node, GMD wants to support actively the conversion of the German EARN to the internationally standardized OSI protocols used in the DFN and the transfer of the users to the DFN. A gateway installed in the DEARN host will convert the OSI standards to the standards applicable in the EARN/BIT-NET.

These networks interconnect more than 2000 DP systems all over the world. More than 600

nodes are installed in Europe, a third of them in the Federal Republic of Germany. There are gateways to all other important networks, i.e. interfaces which convert the protocols of one network into those of the other network thus allowing a communication between the different networks.

Currently the central node handles about 40 billion information bits or 5 billion alphanumeric characters (bytes) per month, this would be a 200 m stack of written DIN A4 pages. The growth is about 80% per year. Three fifths of the data volume is national communication, two fifths international communication.

There will be two international lines starting from the DEARN central node in Bonn:

- one to Montpellier in Southern France, from there to the USA (and via BITNET to Japan, Canada, Mexico and Australia), Spain, Portugal, France, Belgium, the Netherlands, Italy, Greece, Turkey, Israel and Ivory Coast;

- one to Geneva (CERN) with connections to Great Britain, Ireland, Austria, Denmark, Sweden, Norway and Finland.

Please contact: Klaus Birkenbihl,
(+228) 81996-41

ESPRIT 2

INRIA - INRIA will contribute:

- to 18 ESPRIT 2 projects beginning in 1989;

- to 11 Basic Research Actions (9 projects and 2 working groups).

The participation of INRIA has doubled between ESPRIT 1 and this second phase of ESPRIT. The budget will reach 30 mF per year, half of which is being paid by INRIA.

Please contact: Patrick Rambert
+ 83 91 23 75

European Programmes

CWI - At present CWI is participating in the following European programmes (contact persons in brackets, all telephone numbers preceded by +20-592):

- 3 ESPRIT I projects: METEOR (Jos Baeten, 4008), GIPE (Paul Klint, 4126) and 415: Parallel architectures and languages for AIP - a VLSI directed approach (Jaco de Bakker, 4136);

- 3 ESPRIT II projects: ATMOSPHERE (Jos Baeten, 4008), TROPICS (Martin Kersten, 4066) and GIPE II (Paul Klint, 4126);

- 3 ESPRIT BRA projects, starting in the second half of 1989: INTEGRATION (Jaco de Bakker, 4136), SEMAGRAPH (Jos Baeten, 4008) and CONCUR (Jos Baeten, 4008);

- 2 RACE projects: RIPE (David Chaum, 4169) and SPECS (Jos Baeten, 4008)

- COMETT project: Euro-math (Dick Bulterman, 4147);

- ESA-project HERMES (Piet Hemker, 4106).

Open Software Foundation

CWI - The Open Software Foundation OSF was founded in May 1988 by a consortium of nine major computer manufacturers: IBM, DEC, Apollo and Hewlett-Packard in the USA; Siemens, Nixdorf, Bull and Philips in Europe; and Hitachi in Japan. Its capital is about 150 million dollars. The purpose of OSF is to develop system software for its members. Any company, university or research institute can become a member. At present there are about 80 members. OSF will have institutes for research, software development and marketing, both in the USA and in Europe. Its European research institute in Grenoble acts mainly as a transfer point between university research and the OSF development sector. The first product,

the operating system OSF/1, is expected to be ready by the end of 1989. There are Academic and Industrial Advisory Boards. Members of the European Academic Board are: Gerhard Goos (GMD), Gilles Kahn (INRIA), Sacha Krakowiak (LGI/IMAG), Sape Mullender (CWI), Roger Needham (Univ. of Cambridge) and Brian Randell (Univ. of Newcastle). A first proposal for sponsoring has been submitted to OSF; it concerns the project Amoeba, a distributed operating system originating from the Vrije Universiteit Amsterdam. Participants in the proposal are: Vrije Universiteit Amsterdam, CWI, Queen Mary College, the Universities of Cambridge, Lancaster and Newcastle, INRIA, LGI/IMAG, Chorus Systèmes and the University of Bologna.

Please contact:

Gerhard Goos (GMD), (+721) 6622-65
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Call for Integrity Primitives

CWI - RIPE (RACE Integrity Primitives Evaluation) is part of the EC-programme RACE, which aims to pave the way towards commercial use of Integrated Broadband Communications (IBC) in Europe by 1995. RIPE will put forward an ensemble of techniques to meet the anticipated security requirements of IBC.

Interested parties have been invited to submit integrity primitives for security services in IBC. Any digital integrity primitive may be submitted, but data confidentiality is excluded. The deadline for submission is September 15, 1989. More information about the form of submission, evaluation criteria, procedures, etc., may be obtained from:

Gert Roelofsen, PTT Research, P.O. Box 421, 2260 AK Leidschendam, The Netherlands,

+70-436410, telex 31236 dnl nl,
fax +70-436477.

Members of the RIPE consortium are: CWI (prime contractor), Siemens AG, Philips Usfa BV, The Netherlands PTT Research, and the Universities of Leuven and Aarhus.

INTERNATIONAL RELATIONS

ICOT Board of Directors

INRIA - INRIA has been entrusted since 1986 by the French Ministry of Foreign Affairs with the responsibility for cooperation with Japan in Artificial Intelligence. In the framework of this programme, INRIA received on the 20th of October the board of directors of ICOT (Institute for New Generation Computer Technology). In particular, members of the delegation, mainly composed of industrials, have been interested in INRIA's industrial relations and valorization techniques used by the Institute.

Please contact: George Nissen
+(1) 39 63 55 13

Collaboration with NSF

INRIA - On the 20th of October, INRIA received Mrs. C. Glendey who is in charge of the international department of NSF (National Science Foundation) in USA. INRIA signed a collaboration agreement with NSF in 1987 to develop cooperative programmes between research teams in USA and in France. In the framework of this agreement, five projects have already been accepted, three other projects are under consideration and six projects are under preparation.

Please contact: George Nissen
+(1) 39 63 55 13

Indian Research Minister in GMD

GMD - The Indian Minister for Research and Technology, Kocheril Raman Narayanan, paid a visit to GMD during his information trip through the Federal Republic of Germany. At the invitation of the German Federal Research Minister, Heinz Riesenhuber, Minister Narayanan visited a number of German research institutions to discuss the possibilities of an intensified cooperation between Indian and German researchers. Friedrich Winkelhage, Member of the Executive Board, gave a brief overview of the scientific programmes of GMD. The presentation focussed on an introduction to the state of the art and objectives of the SUPRENUM project given by Ulrich Trottenberg, one of the heads of the GMD Institute for Foundations of Information Technology. Another subject of the information exchange was the scientific contacts with India which are especially good in the field of supercomputing. A three-years' project of the Indian Electronics Ministry aiming at the development of a Cray-like parallel computer was also discussed.

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(+2241)14-2255

EVENTS

Operations Research

CWI - The 14th Dutch conference on the Mathematics of Operations Research, organized by CWI, took place on February 13-15, 1989, in Lunteren. This time all invited speakers were from Israel: A. Ben-Tal, M. Hofri, H. Kaspi, U. Passy, M. Rubinovitch, M. Yadin and U. Yechiali (all from Technion, Haifa) and M. Maschler (Hebrew University, Jerusalem). Their lectures cov-

ered various topics in stochastic optimization, mathematical programming, game theory and queueing theory.

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MTNS-89

CWI - The eighth biennial International Symposium on the Mathematical Theory of Networks and Systems (MTNS-89) will be held in June 19-23, 1989, in Amsterdam, The Netherlands. The symposium presents a wide range of recent advances in signal processing, robust control, nonlinear control, circuits and inverse scattering, linear systems, 2-D systems, discrete-event systems, operator theory, nonlinear operators, etc.

The symposium chairmen are: M.A. Kaashoek and A.C.M. Ran (Free University of Amsterdam) and J.H. van Schuppen (CWI). For the Second Announcement and Preliminary Program

Please contact: Stichting International Symposium MTNS-89, c/o Bureau Congreszaken (Conference Service), Vrije Universiteit, P.O. Box 7161, 1007 MC Amsterdam, The Netherlands, +20-5484656; telex 11329 dpvuu nl; fax +20-428998.

AI 88

INRIA - INRIA was present at AI 88, which took place in Tokyo, Japan, from the 4th to the 7th July 1988. INRIA activities in Artificial Intelligence and those of ILOG, the A.I. subsidiary of INRIA, were presented to industrial companies and researchers.

Please contact: George Nissen
+(1) 39 63 55 13

GMD Organizes the European Knowledge Acquisition Workshop 1988

GMD - Knowledge acquisition is considered the most crucial phase in knowledge engineering, the construction of expert systems. It decides on success or failure of the system, on short or long development time, on acceptance and usability. Nevertheless, there are neither elaborated theories nor recipes in this area. A number of international knowledge acquisition workshops intends to remedy that. The second European Workshop on Knowledge Acquisition for Knowledge-based Systems (EKAW) was organized by GMD in Bonn. It was the fourth workshop out of a number of workshops held all over the world. It was the aim of EKAW 88 to gather theorists and practitioners of this domain who were aware of the necessity of a methodical and systematical support of the acquisition and modelling process in the development of expert systems.

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Traffic Symposium

CWI - CWI organized a national symposium 'Planning and Control in Traffic' on October 12th, 1988. About sixty participated. The main purpose of the symposium was to improve contacts between researchers and (potential) users of research results in the field. Such an activity fits in the general aim of CWI to improve knowledge transfer and to be alert on possible application of fundamental research results. The subject was chosen because of its general interest and because at CWI some projects concern traffic research. The programme contained the following subjects: Methodic problems in

quantitative research of the future (M.F.A.M. van Maarseveen, TNO Delft); Equilibrium theory in traffic networks (G.R.M. Jansen, Univ. Delft); Three-dimensional assignment in the time-space for overloaded networks (R. Hamerslag, Univ. Delft); The Eureka project CARMINAT (J. Mauge, Philips Consumer Electronics); Stochastic models for road traffic (R.D. Gill, CWI); International Developments (H. Neffendorf, MVA Systematica, UK).

CWI plans to organize such symposia on a more regular basis.

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Theory of Distributed Systems

GMD - Not technology itself, but the organization of its practical use currently limits the utilization of distributed systems. On the occasion of a workshop held in Königswinter near Bonn, an international group of experts discussed theoretical foundations and fundamental concepts for a better understanding of such systems. In the last years, so-called algebraic calculi, e.g. Millner's CCS and Hoare's CSP, have gained great importance for the description and analysis of distributed systems. The basic idea of these approaches is the modular description of systems by means of suitable composition operators. Such compositional calculi neglect however the correct modelling of concurrency, it is mapped onto non-deterministic sequentialization. The Petri Net Theory, however, provides a direct description of concurrency though compositional aspects have hardly been investigated to date. This has had a negative effect on the applicability of the nets. These two research trends, compositional approach-

es, on the one hand, and precise description of concurrency as in Net Theory on the other, have developed independently of each other though a combination of the two approaches might be quite promising. In this situation, Ursula Goltz from the GMD Institute for Foundations of Information Technology together with Ernst-Rüdiger Olderog (University of Kiel) and Rob van Glabbeek (CWI Amsterdam) organized the 'Workshop on Combining Compositionality and Concurrency'.

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(+2241)14-2800

First Workshop on Connectionism in GMD

GMD - The Gesellschaft für Informatik (GI), the International Computer Science Institute (ISCI, Berkeley) and GMD organized the first workshop on connectionism which gathered more than 80 experts mainly from the research area of artificial intelligence. It was the aim of this workshop to give a synopsis of different activities in this very young domain undergoing a rapid development. The unexpectedly large number of participants has shown the great interest in this new approach within artificial intelligence. This is also emphasized by the fact that the workshop decided to prepare the foundation of a Working Group 'Connectionism' within the Technical Committee 'Artificial Intelligence and Pattern Recognition' of the GI.

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(+2241)14-2437

French-German Workshop on Parallel Computing and Its Applications

GMD - For extensive scientific numeric computations, fast vector and parallel computers and computing procedures tailored to this computer class have enormously gained in importance in the past years. GMD supports this development in the areas of hardware, system and application software by its substantial contribution to the German supercomputer project SUPRENUM. The international exchange of ideas and results and the interdisciplinary cooperation of computer science, numerical mathematics and application sciences are of decisive importance to this new area of parallel computing. A joint workshop of GMD and SUPRENUM GmbH, Bonn together with INRIA in Rocquencourt near Paris served this purpose.

The participating research groups presented the objectives and the state of art of their projects in discussions and lectures. In areas of hardware and system software, the SUPRENUM parallel computer, in particular, project conception, architecture and pre-prototyping, and the French workstation with vector unit (SPS7) were presented. Though originating from two quite different projects, the similarity of important hardware components was most remarkable and seemed to be promising for a further cooperation in this field.

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(+2241)14-2543

INDUSTRIAL TRANSFER

LE-LISP

INRIA - INRIA has just signed a license agreement with the LER, Laboratoires Electroniques de Rennes, a research la-

boratory of THOMSON CSF, for the port of LE-LISP system to TRANSPUTER. This port will be done within the framework of the Esprit Project PADMAVA-TI.

The system LE-LISP V.15.2 is being ported to main workstations and microcomputers by the following companies and institutes:

- INRIA on VAX/UNIX, APOLLO/UNIX, PC.RT and SUN 3;
- ILOG on SUN 4;
- CRIL on APOLLO/AEGIS;
- ACT on processors 80x86 and for PC/MACINTOSH;
- BULL on DPX 1000, DPX 2000, DPX 5000;
- AMAIA on specialized add-on cards based on 80286 and 80386;
- SEMA METRA on HP 9000 (series 300);
- ENST on VAX / VMS

Please contact: Laure Reinhart
(+1) 39 63 54 16

MAILWAY

INRIA - The team led by C. Huitema (RESEAU) at INRIA Sophia-Antipolis has developed a software interface between electronic mail on UNIX and mail delivery conforming to CCETT X 400 recommendations. This product, called MAILWAY, is now industrialized and commercialized by SYNC which is a small French company at St-Etienne. Other license agreement should be signed in a near future by GOULD, MATRA DATA-SYSTEME and Philips. INRIA also distributes MAILWAY to universities and public research centers.

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802.3D

INRIA - The team SCORE of INRIA, led by G. Le Lann, has studied a multiple access protocol called 802.3D which consists of a deterministic version of Ethernet. Research in this domain was partly supported by French Navy and Ministeries in charge of Research and Industry. This protocol was patented by INRIA in 1986.

To ensure the best transfer to industry, INRIA has launched a user club which brings together industrials, constructors and main users of realtime local area networks. The last meeting of this club took place in Paris. This meeting was organized by INTEL which implements a similar process to the process studied by INRIA on its chips 82590/592 and 80C153. During this meeting the company APTOR also presented its recent products based on the 82580 and commercialized under INRIA license. More than 35 persons from 17 different companies attended this meeting.

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Agreements in Networking

CWI - A research agreement was signed last October between the computer company DEC and CWI. The event took place in the presence of the Dutch Minister of Education & Science Wim Deetman, who paid a working visit to CWI. The agreement is part of DEC's European External Research Programme for stimulating technology exchange between its engineering organization and leading research institutes. The allowance consists of hardware to be used in the ongoing CWI research into distributed operating systems.

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+20-592 4139

At the same occasion a declaration of intent was signed between CWI and SURF - a national organization for computer services in higher education and research. The aim is to integrate and extend network services for the users of EUnet (for which CWI acts as gateway for USENET, Internet and other networks) and those of the Dutch academic network SURFnet.

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+20-592 4147

REDUCE and MAPLE

INRIA - INRIA has just signed a distribution agreement for MAPLE with the university of Waterloo. MAPLE is a library of symbolic manipulation systems of more than 75.000 instructions, based on a small kernel of 200 ko. INRIA can provide MAPLE to public research institute or universities for the prize of 6.000 FF.

INRIA is also in charge of the distribution of REDUCE realized by Anthony Hearn, on the LE-LISP version. The translation of REDUCE in LE-LISP was done at INRIA by A. Beges.

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STANDARDIZATION

From FORTRAN 77 to Fortran 88

GMD - The standardized programming language Fortran is currently undergoing the most radical and extensive change of its life cycle. Fortran experts from all countries, especially the members of the Working Group X3J3 of the American National Standards Institute (ANSI) and

the Working Group 5 of the International Organization for Standardization (ISO) elaborated a new draft standard which was published for comment under the title 'Fortran 8x' early in 1988. The final version shall be available as next Fortran standard in 1989. By tradition, the successor of FORTRAN 77 is likely to be called Fortran 88.

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LIFE IN THE INSTITUTES

Reorganization

CWI - From September 1st, 1988, CWI has regrouped part of its research departments, reducing their number from 8 to 6. The former departments of Pure Mathematics and Applied Mathematics are now united into a new department of Algebra, Analysis, & Geometry, headed by Prof. Michiel Hazewinkel. Similarly, the departments of Mathematical Statistics and of Operations Research & System Theory have been fused into one department of Operations Research, Statistics, Probability & System Theory, headed by prof. Jan-Karel Lenstra.

In summary, CWI now has the following research departments and department heads:

Algebra, Analysis, & Geometry (M. Hazewinkel); Operations Research, Statistics, Probability & System Theory (J.K. Lenstra); Numerical Mathematics, P.J. van de Houwen; Software Technology (J.W. de Bakker); Algorithms & Architecture (L.G.L.T. Meertens); Interactive Systems (P.J.W. ten Hagen).

PEOPLE...

INRIA - **Dr. William Jalby**, researcher at INRIA in the project CAPRAN (Parallel Architectures) conducted by A. Lichnewsky, has taken a professor position at Rennes University. DR. W. Jalby will follow up collaborations with INRIA through the CAPRAN project and the project CALCPAR of J. Lenfant from INRIA Rennes.

INRIA - **Prof. Bernard Espiau**, head of the project "Robots perception and commands" has taken a position as the head of the "Institut Supérieur d'Informatique et d'Automatique (ISIA) at Sophia Antipolis. Patrick Rives, Daniel Simon and Jean-Jacques Borrelly, researchers from B. Espiau's team, will participate to the PRISM Project conducted by D. Boissonnat at INRIA Sophia Antipolis.

INRIA - **Prof. Pierre Aigrain**, ex-Secretary of State for Research and President of the Scientific Council of INRIA, was elected to the French Science Academy in the Physics Section.

INRIA - **Dr. Bernard Larrouturou**, Director of Research at INRIA Sophia Antipolis, received the prize PECCOT 88 of the Academy of Science. This prize is conferred every year to a young mathematician of less than 30. B. Larrouturou's works mainly relate to the modelization and mathematical analysis of the combustion phenomenon.

INRIA - **Prof. Henri Beresticky**, scientific adviser of the SINUS project, received the prize CARRIERE 1988 of the Academy of Science.

GMD - **Prof. Norbert Szyperski**, Chairman of the Executive Board of Mannesmann-

Kienzle GmbH in Villingen-Schwenningen was appointed Chairman of the Supervisory Board of GMD by the German Federal Minister for Research and Technology, Heinz Riesenhuber. Szyperski succeeds Prof. Dr. Fritz-Rudolf Güntsch, head of the division 'Information and Production Technology; Living and Working Conditions; Scientific and Technical Information' of the Federal Ministry for Research and Technology who had been Chairman since 1973. With Szyperski, for the first time, a representative from industry has become Chairman of the Supervisory Board of the governmentally funded GMD.

GMD - **Prof. Gerhard Seegmüller**, Chairman of the Board of Directors of the Leibniz Computing Centre of the Bavarian Academy of Sciences and full professor at the University of Munich was appointed Chairman of the Executive Board of GMD. Seegmüller succeeds Prof. Dr. Szyperski who joined Mannesmann-Kienzle GmbH in Villingen-Schwenningen as Chairman of the Executive Board.

GMD - **Dr. Carl Adam Petri**, one of the heads of the GMD Institute for Foundations of Information Technology, was appointed honorary professor of the University of Hamburg. In addition, Petri was awarded the 1st class Service Cross of the Federal Republic of Germany. Both events recognize the outstanding and trendsetting research work in computer science done by Petri. Today there are thousands of publications worldwide which are based on Petri's ideas.

CWI - **Prof. Hans Lauwerier**, head of the former department of Applied Mathematics, retired on November 30, 1988, after a career of 35 years at CWI and of 30 years as a professor at the University of Amsterdam. In the early years his

attention mainly went to mathematical problems in connection with the North Sea. In the eighties he explored various problems in bio-mathematics. He also wrote some popular books on fractals, on symmetry and on doing mathematics with a home computer.

CWI - **Prof. Richard Gill**, head of the former department of Mathematical Statistics, left CWI on September 1, 1988, to accept a professorship in Stochastics at the University of Utrecht. He was a staff member from 1974.

CWI - **Dr. Jacques Bus**, head of the sector Research Management & Presentation, left CWI on September 1, 1988, for a position in Brussels as Scientific Officer in the ESPRIT Programme CIM. His career at CWI started in 1971. He was succeeded by **Fred Bakker**.

