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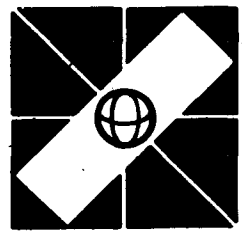

EDITOR
WAYNE A. KALENICH
IBM CORPORATION

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FOREWORD:
REPORT ON THE CONGRESS

W. BUCHHOLZ (USA)
Congress Chairman

Although the main purpose of the IFIP Congress 65 Proceedings is to provide a lasting record of the scientific program, it seems appropriate to include in this post-Congress volume an account of the non-technical part of the Congress, if only for the benefit of readers who were not able to attend.

The organization of IFIP Congress 65, following the pattern of its predecessor, was split into two major parts. To assure an international representation, the scientific program was prepared by an international Program Committee under Program Chairman B. Langefors of Sweden. All other, more local arrangements were the responsibility of a Congress Committee in the United States under Congress Chairman W. Buchholz. Both chairmen reported directly to I. L. Auerbach, then IFIP President. The committees began work in 1962. The rather long three-year cycle permitted careful plans to be drawn up in advance for approval by the IFIP Council before any of it had to be put into effect. Unhurried planning is strongly recommended for a large international Congress.

Specifically the planning for IFIP Congress 65 started in March 1962, even before IFIP Congress 62 took place. At that time IFIP accepted an invitation by AFIPS, the American Federation of Information Processing Societies, to hold the 1965 Congress in New York City. New York was a logical site for this international computer conference for several reasons. It is the hub of much of the information processing activity in the United States: both makers and users of computing equipment are concentrated in and around the city. It is an international center with a cosmopolitan population and the United Nations Headquarters. An added attraction was the 1964-65 New York World's Fair. And, most important to the success of this international Congress, AFIPS canceled its 1965 Spring Joint Computer Conference, previously scheduled for New York. AFIPS thereby contributed considerable experience and resources to the organization of IFIP Congress 65.

AFIPS conferences in the four major cities of the Eastern United States (New York, Washington, Philadelphia, and Boston) have become a tradition that started in 1951 with about 900 participants. (A parallel set of Western U. S. Conferences was started later.) In 1955, when participation had grown to almost 2,000, Prof. J. W. Forrester of MIT in his conference summary made a prediction for 1965. He predicted that a computer conference in 1965 would have an attendance of 4,600 and recommended that the committee plan accordingly. He did not, of course, foresee that the conference would become an international event. Still, a look at the statistics shows that his crystal ball was pretty well calibrated.

About 5,000 registrants attended IFIP Congress 65, including ladies and guests. Of these 4,200 came from the USA and 800 from 34 other countries (Table 1). The scientific program consisted of 77 different sessions and listed 500 names of people participating directly in the sessions. The Interdata 65 exhibition was viewed by approximately 12,000 people.

These impressive statistics show the Congress to have been the largest information processing conference ever held. The organizing committee had based its plans on an attendance in the range of 3,500 to 6,000, and it was pleased to find the actual attendance to be well within this range. Thus the Congress was financially solvent, yet—with few exceptions—the facilities did not become crowded. More important than numbers, however, was the quality of attendance; one received the impression that an unusually large number of experienced technical people attended and contributed to the flow of information.

Fortunately all Congress activities, including technical sessions and exhibits, could be held under the one roof of the large New York Hilton Hotel. The main speaker at the opening session on Monday morning was Dr. Donald F. Hornig, Special Assistant for Science and Technology to the President of the United States of America. The scientific program started Monday afternoon and consisted of 8 or 9 parallel sessions each half day. The two major sessions had provisions for simultaneous interpretation between English and French; one of the rooms was also equipped for interpretation into Russian and Spanish. Printed abstracts of the major papers were available in these four languages. The Congress closed Saturday morning with a single session on the exciting subject of "Man as an Information Processing System." It featured talks by three eminent scientists who used films and demonstrations to illustrate their subjects. The sessions were generally well attended. Even after a long week of sessions, an estimated 700 persons stayed to hear the final papers.

Table 1. Registrations from countries other than USA

Registrants	Country	Registrants	Country
4	Argentina	1	Jamaica (W.I.)
6	Australia	25	Japan
8	Austria	15	Mexico
6	Belgium	50	Netherlands
1	Brazil	1	New Zealand
108	Canada	7	Norway
1	Chile	1	Peru
10	Czechoslovakia	2	Poland
15	Denmark	4	Rumania
3	Finland	3	South Africa
153	France	3	Spain
90	Germany	48	Sweden
2	Hungary	18	Switzerland
2	India	133	United Kingdom
1	Ireland	13	USSR
5	Israel	2	Venezuela
32	Italy	1	Yugoslavia
	Total	774	from 34 countries

As in the previous international conferences, multilingual Scientific Secretaries were available to assist each session chairman and to collect written material for publication in this volume. The Scientific Secretaries also published a Daily Bulletin containing last-minute changes in the program.

A tradition of both AFIPS and IFIP computer conferences are the fine exhibits, which also have grown over the years. In 1955 there were 53 booth spaces; this year there were 228. Most participants in these conferences regard the exhibits of new equipment and techniques as an essential part that is not to be missed. Such exhibits concretely illustrate the rapid progress in computer technology. If a picture is worth a thousand words, an exhibit is worth a hundred pictures.

Carrying forward the *Interdata* name from the last IFIP Congress, this year's exhibition was Interdata 65. A total of 83 exhibitors presented their latest developments, and several gave lectures related to their exhibits. These Exhibit Lectures, which were separate from the main Congress program, provided more information than could be given at the exhibit booths. Other events open to exhibit visitors, whether or not they attended the Congress, were the films of the Information Sciences Cinema and a variety of plant and laboratory tours.

The equipment shown at Interdata 65 illustrated the continuing rapid evolution of the electronic computer into a most remarkable and versatile tool. Appropriately enough, this tool also found application in organizing the Congress. Registrations were processed by computer to account for advance registrations, to produce mailing labels for the Proceedings, and to update registration lists and financial records.

Another of Prof. Forrester's predictions was that by 1965 there would be considerable application in the real-time control by computers of other equipment, as in oil refineries. This has certainly happened. He did not quite predict the current high interest in time-shared computers, although they are a logical extension to provide real-time control of computers by people. Several time-shared systems operated by universities as far away as California, and directly connected to terminals at the Congress, were demonstrated daily in sessions especially set up by AFIPS so that participants could see for themselves. These, as well as commercial time-shared systems demonstrated by exhibitors, created a great deal of interest. In fact, a time-shared computer of this sort was used by the Committee to keep track of the complex scientific program with its inevitably many changes and to assist in typing the multilingual abstract booklet. There is still much more to be done, of course. For example, we are far from ready to have machines take on the very difficult task of simultaneous interpretation at an international conference. There is no doubt, however, that more progress will be made and the computer field will continue to grow rapidly.

When not involved in technical matters, Congress participants and their ladies had a great many special events and activities to choose from. Highlights were the Theater Evening and the IFIP Banquet. The Theater Evening provided a splendid performance of the famed Broadway musical "Hello Dolly!" starring Carol Channing. The special IFIP performance was sold out. The Finance Committee did record one loss: a rose out of Miss Channing's bouquet, which co-star David Burns ate *ad lib* during curtain calls, accompanied by much laughter from cast and audience alike.

Some of the Congress participants took part in a People-to-People Program organized by the Congress

Committee to bring together visiting information processing scientists from other countries and American hosts with similar professional interests. This opportunity to meet and exchange views on an individual basis was a rewarding experience to those who could take advantage of it, and it contributed to mutual understanding and good will.

The Proceedings of IFIP Congress 65 are published in two volumes under the title *Information Processing 1965*. Volume 1 appeared during the Congress and contained technical papers given at the *general* and *special sessions*. The present companion volume contains addresses given at the opening and closing sessions; most of this volume, however, is devoted to summaries of the *symposium* sessions and reports of *panel* discussions, since space limitations prevented publication of the full text of the many technical papers presented at these less formal but very worthwhile sessions.

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WELCOME

ISAAC L. AUERBACH, PRESIDENT
International Federation for Information Processing

Welcome to IFIP Congress 65. As President of this great Federation I have the honor to welcome many of you to the United States. As a citizen of the United States I have the additional pleasure of welcoming you to my own country.

IFIP Congress 65 is a very special technical meeting because it deals with a very special technology, the digital computer and its application to information processing. Information processing will have a more beneficial impact on mankind than any invention of the 20th century.

This Congress will provide a rarely available international view of the information sciences. Those attending will hear first-hand reports on the latest technological developments and applications. More important, they will be able to meet with and exchange ideas with the men and women working in this field.

This is the first computer conference that has taken full practical advantage of the use of a computer. The registration, administrative details and program record keeping have been automated.

Many people have been working many months—actually starting before the last IFIP Congress in 1962 in Munich—to make this congress possible. Over 185 people have been involved in bringing the arrangements for this congress to fruition.

Over 500 people are involved in presenting the very comprehensive program which has been planned for your enjoyment, enlightenment and enrichment. Great efforts have been expended to create a technical program that is both internationally and technically balanced.

Werner Buchholz, Congress Chairman, and William Lonergan, Congress Vice Chairman, through their many committees have been responsible for the arrangements, exhibition, special events, etc. Börje Langefors, Program Chairman, and Alston Householder, Program Vice Chairman, through their international area chairmen, have planned the technical program. It would take a computer to compile the statistics regarding the man-hours that all of these men and women expended to make this Congress possible. And no computer could equate these figures with the *outstanding* quality of their work. They have done a magnificent job and we are indeed grateful.

A progress report is appropriate at the opening session of this Congress. I am happy to report that IFIP, despite its youth, has achieved an impressive record.

IFIP technical committee TC-1 on *Terminology*, jointly with the International Computation Centre in Rome, has produced a vocabulary of 1,500 information-processing concepts and terms. The English version of this vocabulary is now being typeset and will be available soon. Translations of this vocabulary into French and Italian are being prepared. In addition the committee is translating the vocabulary into at least another half dozen languages. IFIP/ICC TC-1 will continue to expand and revise the existing vocabulary as required.

IFIP technical committee TC-2 on *Programming Languages* submitted—and the IFIP Council has approved—three ALGOL documents. They have been published in technical journals throughout the world. These IFIP ALGOL documents were requested by and submitted to the International Standards Organization for their consideration. The members of this committee are continuing their work in expanding ALGOL and in investigating other programming languages.

IFIP TC-2 held a meeting during September 1964 in Vienna on *Programming Language Description Languages* and the proceedings of this meeting will be published.

IFIP technical committee TC-3 on *Education* is:

1. Promoting the establishment of educational committees in as many member countries as possible to exchange information on university courses at both graduate and undergraduate levels;
2. Acting as an international clearing house for the dissemination of information regarding the development, application and implications of information processing. This will provide information to other disciplines so that they may learn to use information processing to further their own work;
3. Jointly with ICC, developer of an advanced seminar for Automatic Data Processing to be held in Rome starting in October 1965 and continuing for six months, to train teachers from developing countries. These teachers will then return to their own countries to train others in the use of computers and information processing.

In addition to the valuable work of these committees and the international triennial congresses, IFIP sponsors other technical meetings either alone

or jointly with other international federations. In September 1964 IFIP participated with the International Federation of Automatic Control in a joint conference held in Stockholm on digital computers and automatic control. The proceedings of this most successful meeting are being published.

A second joint conference with IFAC is planned for October 1965 in Munich on *Microminiaturization in Automatic Control Equipment and Digital Computers.*

IFIP is in addition exploring with the International Federation of Documentation a joint conference on mechanized information storage and retrieval to be held in Europe sometime in 1966. Other jointly sponsored projects are being discussed.

IFIP shall continue an ever-widening program of activity, within the limits of our energies and facilities, to fulfill our objectives which are to:

1. Sponsor international conferences on information processing, including mathematical and engineering aspects;
2. Establish international committees to handle special tasks falling within the realm of member societies; and
3. To advance the interests of member societies through international cooperation.

The computer and information processing have made possible remarkable technological and economic advances. Space exploration is one. No man, be he Russian or American, could have entered space without the digital computer. The record economic prosperity of the United States is another. Computer control of inventory has leveled out the traditional business cycle to the extent where the United States is enjoying its 50th consecutive month of economic prosperity.

This is the answer to the professional alarmists who always speak about computers and unemployment in the same breath. These unparalleled 50 months of economic prosperity have kept more people employed than at any time in our history.

It's true that technology is moving ahead so fast that some skills are being made obsolescent. The industrial revolution made it necessary for people to learn new skills. The information revolution is doing the same. In order to stay productive, people will have to learn new concepts and new skills on a continuing basis. Education will have to become a lifelong process rather than a youthful pursuit. This may seem radical, but the idea of universal public education seemed equally radical in the early days of the industrial revolution.

To us—to the men and women working in the information-processing field—the idea of continuing education is already a reality. *Education* is the one word that sums up the reasons why all of us are here today, and it sums up the purposes of this IFIP Congress 65. We are here to learn.

The information revolution is irrevocable and irreversible. We must make certain that it is not irresponsible.

RESPONSIBILITIES AND OPPORTUNITIES IN INFORMATION PROCESSING

DONALD F. HORNIG

Special Assistant for Science and Technology to the President of the United States

It gives me great pleasure to be able to welcome the attendees to this Congress of the International Federation for Information Processing. As Mr. Auerbach said in his welcoming message, there is hardly an area of our lives which is not already being transformed by developments in information processing technology. It seems quite clear that what we have seen so far is only the beginning; that changes in information handling will lead to changes in the generation and use of information which go far beyond mere refinement of means for doing our current jobs. And you, here assembled, will play a leading role in this almost revolutionary transformation.

This is no task to be confined within national boundaries. Science and technology recognize no national boundaries; good work is being done in many countries. It is, therefore, my special pleasure to be able to welcome so many guests from outside the United States. There are many active centers of research, development, and application of information technology around the world. And it is altogether fitting and appropriate that your own advanced technology be used to transfer information about your rapidly moving field of activity. Yet personal contacts, as in this Congress, still play a vital role in the transfer of ideas. I welcome you, and sincerely hope you enjoy and profit from your stay in this country.

While there are many other pieces of hardware associated with information processing, and a large amount of related software, the computer is at the heart of the revolution in information processing. The Federal Government, processing as it does huge amounts of information, frequently under urgent pressures for rapid correlation and recall, has been a major factor in the development of the computer industry in this country. The number of computers used within the Federal Government has grown from 10 in 1954 to 1,767 in 1964. This is considerably more than even the most optimistic predictions in the early days of the computer. Phenomenal as this growth has been, we expect even more in the decade ahead.

No single technological advance in recent years has contributed more to effectiveness and efficiency in Government operations than the electronic computer. But the effects have gone much farther than the efficiency. It has enabled Government to carry out programs never before possible. Most of the important advances in space exploration, weather forecasting, and atomic energy would not have been possible without the computer. In insurance processing, checkwriting, and the tax system, the computer has been at the root of major cost-reduction efforts. Furthermore, the use of computers to support advanced management techniques is becoming common in a broad range of governmental activity, after initial successes in military areas and supply management.

The extremely rapid exploitation of the computer has not been without its problems. Along with its opportunities it has brought its responsibilities. Within the Federal Government these problems have ranged from developing means for selecting those computer uses with the highest payoff, to the need for coordinating research and development findings in the various Federal agencies, to the effect of computers on types and numbers of people required for optimum computer application.

There is an urgent need for management to concern itself intimately and actively with computer information processing—whether management is in business, government, education, or one of the professions. Because this is a new technology, whose most visible and tangible manifestation is a piece of hardware—complete with flashing red, green, and white lights, there has been a tendency to regard it as the particular responsibility of the computer technician.

Yet the application of computers to information processing raises problems for management and requires decisions of management. As you in this audience know so well, computer applications may have a marked effect on the structure of organizations, the type and numbers of jobs and working conditions. They also frequently affect not only the means and cost of providing service to the public, but also the kind of service provided. And finally, they may have a significant effect upon the way a manager exercises control within the organization.

Managers must, therefore, get a broad understanding of both the potentialities and the limitations of the new information processing technology. Management must take steps to make certain that decisions on systems objectives, timing, cost, evalua-

tion, and other management-type decisions are made by managers.

Several Federal Government agencies have begun developing policies governing the management of computer information processing systems. The Bureau of the Budget, the General Services Administration, the Civil Service Commission, and the National Bureau of Standards have been especially active in this area, and it has engaged the increasing attention of the Congress and the General Accounting Office.

The President, aware of the increasing significance of the computer and the problems raised, directed that the Director of the Bureau of the Budget undertake a comprehensive study of the management of ADP activities of the executive branch. The results of this study were reported by the President to the Congress on March 2 of this year. The study recommendations are also the subject of recently introduced legislation.

Let us now briefly take a look at some of the opportunities lying ahead of us in the civilian economy.

The mathematical modeling of the total civilian economy in the United States so that interactions between various segments of the economy could be quantitatively determined has waited for the advent of the computer. Too complicated to be attempted by hand calculations, this job has only recently been undertaken, even though it was realized that such a model, if used for predictive purposes, would provide the basis for a much-needed business "early-warning" system. The efficiency of our economy is directly related to the accuracy of millions of economic and business decisions made throughout the United States each year. The timely availability of information becomes a critical factor in making the right decisions.

A few months ago, the Department of Commerce completed a five-year, intensive study of the interindustry structure in the United States. Known as an "input-output" study, these data permit us to trace the intricate chain reaction throughout some 86 segments of the economy resulting from any change in one of the segments—for example, from an increased demand for new cars. This project, plus a related project now underway to develop an abbreviated model of the national economy, offers potential opportunities for determining almost immediately the broad consequence of major changes in fiscal policy or tax regulations, for detecting trends, and thus for taking the necessary advance actions.

We are already in the initial stages of computer information processing systems applied to transportation. You are probably aware from personal experience—as I am—of the nearly instantaneous customer reservation service provided by centralized electronic computers for several airlines. What a welcome change from the old system! But are you aware that one of these systems also provides automatic records of actual take-off, loading ramp departure, landing and engine shut-off time for each flight? Such a system provides not only a record for calculating pilot flight-times, but also a data base leading to more effective airline operations!

In Toronto, Canada, automotive traffic is being regulated by a computer data processing system. The objectives of this system—to reduce auto congestion and hence traffic delay—have already been achieved to a significant degree in a selected area of Toronto. Travel time has been reduced by an average of 18% in the controlled area, while during peak hours the delay in the peak direction has been reduced by 28% along some 2-mile arterial lengths. The results have been so satisfactory that extension of the system to the whole of metropolitan Toronto is now in progress.

A major use of computers was involved in the recently completed Department of Commerce study of the supersonic transport program. Large numbers of variables—such as the size of the market for supersonic transports, the structure of the flight routes, the rate of technological development, research and development costs, effects of sonic boom, the necessary resources for the program, the balance of payments and a host of other variables—were examined. In the pre-computer era, it would have been almost impossible to even organize the data in a meaningful way. The results of this study, portraying alternate courses of action and their consequences, will undoubtedly have a major influence on Federal Government and industry decisions.

Our national commitment to a better understanding of the skies above us and the waters around us has already resulted in tremendous masses of data being collected. The traditional weather and oceanographic laboratories were flooded with data. We see no diminution of this effort ahead—quite the contrary, thus emphasizing the need for modern information processing technology in assimilating data in ways which allow conclusions to be drawn. In oceanography we are now experimenting with computers on board the experimental ships. No longer will the oceanographer have to wait until the ship returns to port to gain an appreciation of his findings and to discover possible flaws in the experimental technique. The U. S. Weather Bureau has kept pace with advances in computer design to assemble the reports from all over the country and aid in its function of weather prediction, starting with the first computer in the late 1940's.

In medical care we are on the threshold of revolutionary changes in information processing techniques. Hospitals first used computers for complex accounting problems. Before long the resident staff was experimenting with calculating the statistical significance of clinical observations. In recent years

the emphasis has been on developing "on-line" gathering of data directly from the patient and nurse, the immediate processing of these data, and rapid display of the correlated results to the attending physician.

As one example, at the Massachusetts General Hospital a time-shared computer connected to a number of teletypewriters located in the hospital now provides for recording of drug orders, the automatic preparation of up-to-date lists of the drugs to be given, the charting of drug administration, recording and summarizing critical laboratory data, recording admission data, and inventorying available beds. Drug orders are automatically checked against the dosage recommendations stored in the formulary.

Let us not forget a most important computer application. I am sure the U. S. residents here are all glad that computers are now being used to ensure that they do not accidentally overpay their income tax!

So far I have been talking mainly about the application of computers to numerical data. There is another application area, which because of its greater difficulty, has not yet had such success—I refer to computer processing of natural language. This enormous field is of such importance, however, that there are tens of millions of dollars spent on research and development each year. Success will be the key to the widespread use of computers in almost every human activity. Success will give us the maximum opportunity to exploit the potentialities of the computer to aid everyday men and women in their everyday tasks. And I am confident of success.

The debate of the last decade on whether computers are "giant brains," whether they can think and learn, has now been replaced by a much wiser discussion of the specific ways by which computers can *help men* do thinking and learning. It is in this area that computers will make their big contribution during the next decade.

Computers are slow and awkward and expensive in performing unstructured intellectual tasks. Basically, this is due to the relatively primitive, compared to man, heuristic ability of present computers. It appears that for the last decade we have been underrating man's ability to solve other types of information handling problems simply because he is not adept at handling large arithmetical problems. But man's ability to formulate the problem in the first place, to select a promising line of attack to generate theories and hunches, and to set the criteria for problem solution is far ahead of our present understanding of how to program computers to perform similar tasks. It is for these reasons that I feel confident that the fastest, most applicable progress in computer information processing technology in the next decade will lie in better, faster, more direct coupling of man's heuristic abilities and the computer's algorithmic capabilities.

The system for handling research and development results more effectively and efficiently has been a fertile field for applying advanced information processing technology. Vice-President Humphrey, while he was in the Congress, stimulated many executive branch agencies to make intensive studies of their information systems. The Office of Science and Technology and the Federal Council for Science and Technology have also studied the coordination and integration of the individual agency systems. At this time a substantial effort in my office is being devoted to advising and assisting the Federal agencies and interested national groups on ways to establish a more effective and efficient national network of information systems for the support of science and technology.

There has been considerable progress. The use of a computer for storing journal bibliographic data in the medical field, coupled in a revolutionary manner with a composing machine, has become routine at the National Library of Medicine. Great reductions in the time required to print the published version of *Index Medicus* have been accomplished, and a side-benefit (which is growing in importance steadily) of computer searches of the stored literature has also been achieved.

An agreement has just been reached with the American Chemical Society for their *Chemical Abstracts Service* to conduct largescale development trials of a computer-based registry of chemical compounds. It is our hope that this registry will become the foundation for a nationwide, and possibly international, computerized network of chemical information systems, serving private industry, governmental agencies, and universities.

Several experiments are planned or are underway on the application of computers to library operations. Not only are the traditional library functions of acquisition, announcement, distribution, etc. being studied for mechanization, but there are bold, imaginative plans for a completely different type of library. Such a library will employ a time-shared computer with remote inquiry and display stations. Already some limited experiments give real promise that this approach will be fruitful.

I look towards the professional societies for considerable help in bringing about the new order, in close coordination with Federal Government needs. Perhaps international professional organizations, such as yours, can help bring about better international information systems.

There have been a number of excellent studies of this problem area over the past few years, several of them sponsored by the Executive Office of the President. We are now engaged in active attempts to test the various recommendations, and to implement those found satisfactory.

Finally, I'd like to indulge in some philosophy. There are some who act as if information processing were a wholly new thing. The progress of human civilization has always been closely tied to man's ability to acquire information and to use it. But the knowledge available to any small group, and the knowledge which could be transmitted to successive generations really was very limited. I am sure the greatest contribution so far to information storage, the organization of information, the transmission of information, has been the invention of written languages. Written language made it possible for mankind to accumulate his experience, to record it in books and to organize it in libraries for the use of successive generations. In its total impact on human progress I doubt that the contribution of the computer is as great—although perhaps one day it may be.

A second great invention in information processing was a number system, and arithmetic based on a number system. It, too, can be regarded as a tool for handling quantitative data. Without it the modern world—and the computer—could not exist.

A new dimension in data handling came from the development of geometry, algebra and more generalized types of mathematics. This degree of generalization, the development of general theorems, did two things: first, the relationships constituted a means of organizing empirical observations and second, the generalizations *reduced* the amount of data which needed to be accumulated. A mathematical theorem allows me to calculate some quantities when others are known—so there is no longer any point in preserving the derived quantities. More information is available from fewer recorded facts.

Modern science is an extension of the notion of mathematical generalization. It seeks out generalizations about nature which reduce the number of independent facts about nature which need to be preserved. This is a notion which is not always appreciated. Science rests on empirically collected observations, and the information collected, is mounting exponentially, but the goal of science is not to accumulate facts—it is to organize those facts, to find such generalizations and such laws as will make it possible to recreate those facts without recording and preserving all of the trivial details. This is what we usually mean by *understanding*. A good part of the modern so-called information explosion consists of unreliable facts and unimportant or trivial observations, and one of the most important aspects of information processing—it seems to me—is to learn what to discard, to learn to throw away what is not worth processing.

What is happening now is surely another revolution. The modern computer not only records information in its memory, it can organize and sort it, it can perform logical and mathematical operations on it, providing only that someone will tell it the rules for the game. And it can do these things at such phenomenal speeds that the amount of data which can be dealt with in any time period has expanded by many orders of magnitude. Certainly these capabilities will continue to grow.

But what may be much more important in the long run than the computers in themselves are the people such as you who work on automatic data processing. For just as the combination of mathematics and physical science gave new dimensions to our understanding of nature, the new ways in which the machines are used, and what gets designed into them to handle information of all sorts, not only improve government and business and advance science—they will provide, I'm sure, new levels of understanding in economics, the social sciences and even in the humanities and fine arts.

For as I said, the progress of civilization is limited by the information available to its people and its organization. The expanding technology and science of information processing will put more relevant information at the disposal of the right people in the right form, and it seems inevitable that such developments will transform the world in which we live.

STATEMENT FROM THE DIRECTOR-GENERAL OF UNESCO

Delivered by
ARTHUR GAGLIOTTI
UNESCO Liaison Office, United Nations

It is for me a pleasant duty and an honour to greet you on behalf of the Director-General of UNESCO, Mr. René Maheu. It is especially pleasant to be here today among the members of the International Federation for Information Processing, as we are, as it were, members of the same family considering the role played by UNESCO in the establishment of your Federation. UNESCO is very proud of the part it played along with the other founders of IFIP. So many newcomers are present here today that perhaps you will allow me to recall that your Federation was, in fact, born during the preparation of the International Conference on Information Processing which was organized by UNESCO in Paris in June 1959. The initial suggestion for convening such a Conference was made in the name of the National Joint Computer Committee of the U.S.A. by I. L. Auerbach, who was already in the front of the marching wing in this field.

The meetings of consultants convened by UNESCO for preparing the first International Conference on Information Processing provided a good opportunity to discuss the aims and organization of the Federation and to prepare its statutes. These statutes were approved, during the UNESCO International Conference, by the representatives of Information Processing Societies from 18 countries. A provisional Bureau was created with Mr. Auerbach as President, and the statutes became effective in January 1960, after ratification by 12 national organizations.

For a short period a UNESCO staff member had been responsible for the Secretariat of the Federation, in the framework of the activities of the Provisional International Computation Centre in Rome, and small financial assistance was provided by UNESCO. But both types of help were soon unnecessary as the Federation showed itself to be a solid organization from the very outset. In fact, its speedy development seems to reflect the extremely rapid development of your techniques and the fantastic increase in the speeds of your large automatic calculating machines.

Some 1,800 participants were present at the first Conference organized by UNESCO, nearly 3,000 from 41 countries at the second Congress organized by your Federation in 1962 in Munich and some 5,000 from 50 countries are expected at this present third Congress. This extraordinary increase in the number of participants is paralled by technical progress and the breadth of the topics covered. If future development continues at the same rate, it will become a problem of serious concern in relation to the organization of the next Congress in 1968, about which the authorities of IFIP are certainly thinking already.

In between the Congresses your Technical Committees on Terminology and Symbols, for Programming Languages, and on Education, which work in close collaboration with the International Computation Centre also established by UNESCO, show equally a high record of activity. The papers you will present and discuss during the present week will constitute the most complete inventory of new achievements in the field of information processing, so highly developed in the short time which has elapsed since the discovery, some 21 years ago, of the first electronic information processing machine. This was a new landmark in the application of science to the welfare of mankind, even if some social consequences, namely in relation to employment, are presented as negative against the positive trend of technical progress. Studies on the social aspects of your activities are not included in the Agenda of the Congress. As Mr. Auerbach has indicated in his opening address, this negative aspect is more imaginary than real. Nevertheless, it deserves some attention to avoid misunderstanding and antagonism. Happily, it has not prevented scientists and engineers from continuing their researches towards further progress. Full information, presenting objectively to the general public both aspects—good and bad—of the picture, would help clarify the situation by showing the general advantages provided by this powerful new knowledge and these new techniques.

However, there is one problem related to the information processing activity which I think must be called to the attention of this conference. Over 90 per cent of the people in this room come from the developed areas of the world. This highlights the gap between the developed and developing regions in your particular field. And the gap is growing. This problem may be likened to a cross-country race. You are the front runners who have already covered the rough ground, the hills, gullies, and forests, and reached the flat ground where you can make better time. The developing countries are

still in the rough country, indeed, right at the beginning of it. With every stride, the distance between you grows greater. The only way to ease the problem is for you to reach back your hands and help the others.

Finally, as the representative of an organization for which peace is the permanent motto and guide, allow me to hope that whatever the language utilized and the complexity of the formula used, the output of the machines and the outcome of the new theories will contribute to the progress and welfare of mankind through the development of a scientific and technological society, which if it is at the same time humanistic will attain a high form of culture and be the best guarantee of peace. In the framework of this perspective I wish you the greatest success in your work and activities during and after the present Congress.