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Serie II: LINGUISTICA *Vol. 36*

A. ZAMPOLLI, N. CALZOLARI EDITORS

COMPUTATIONAL AND MATHEMATICAL LINGUISTICS

Proceedings of the International Conference on Computational Linguistics

Pisa, 27/VIII - 1/IX 1973

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FIRENZE
LEO S. OLSCHKI EDITORE
MCMLXXVII

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PREFACES

PREFACE

Au moment où les annales de la Conférence Internationale de Linguistique Computationnelle de 1973 vont paraître, je suis heureux de présenter l'activité de l'International Committee for Computational Linguistics et de rendre hommage aux organismes et aux personnes qui ont apporté leur concours au succès de cette activité.

Sous le vocable de « Computational Linguistics » on trouve une grande variété d'activités qui se trouvent au carrefour de la linguistique, de l'informatique et de l'intelligence artificielle. Les contours en sont mal définis et bon nombre de travaux peuvent être revendiqués aussi bien par la linguistique computationnelle que par l'une des trois disciplines précédemment mentionnées (sans parler des inférences provenant de la statistique, de l'algèbre du monoïde ou encore de la théorie de la calculabilité). Néanmoins, l'évolution de la linguistique computationnelle, qui, initialement, était surtout une juxtaposition de spécialistes d'une seule discipline, atteint à présent une forme interdisciplinaire très accentuée qui lui confère sa propre originalité.

L'informatique organise ses conférences internationales depuis 1959, la linguistique appliquée depuis 1964, l'intelligence artificielle qui est pourtant très liée à l'informatique s'est individualisée en 1969. La linguistique computationnelle n'aurait trouvé dans l'une ou l'autre de ces instances qu'une place marginale, faisant apparaître seulement un aspect de son activité et renforçant la juxtaposition au détriment de l'intégration. Aussi, la création de l'International Committee for Computational Linguistics en 1965 à New York juste après la conférence de l'I.F.I.P. fut-elle une heureuse opération.

Sans doute y avait-il une volonté commune de la part d'associations nationales et de la part de nombreux spécialistes de divers pays qui se connaissaient depuis plusieurs années pour favoriser un tel projet. Nous devons tous au professeur David G. HAYS d'avoir pris l'iniative de cette création et d'avoir assuré le développement ainsi que l'audience de ce comité. Sous sa présidence furent organisées les trois premières conférences internationales (New-York 1965, Grenoble 1967, Stockholm

1969). L'audience internationale était alors solidement implantée. En 1971, la quatrième conférence eut lieu à Debrecen et fut organisée par l'Académie des Sciences de Hongrie.

Nous avons été invités a tenir la cinquième conférence à Pise en 1973.

La présidence du Comité de programme a été assurée par le Dr. Hans KARLGREN, membre de l'ICCL depuis sa fondation en 1965.

L'organisation de la conférence de Pise fut particulièrement remarquable; qu'il me soit permis de remercier ici: le Consiglio Nazionale delle Ricerche, le Centro Nazionale Universitario di Calcolo Elettronico (CNUCE) de Pise, le Centre Scientifique de l'IBM Italie de Pise, et notre coordinateur général, le professeur A. ZAMPOLLI qui, au delà du congrès lui-même, s'est occupé de la publication de ces annales.

B. VAUQUOIS

FOREWORD

The present collection of papers covers a wide range of interests and attitudes. While presumably nobody will enjoy every item, I expect every reader to find several contributions which are stimulating to him and every contribution to find delighted readers. Since I am one of the few who have read them all – acting as the Chairman of the Program Committee – let me say a few words on the criteria adopted in organizing this work.

The characteristic feature of Computational Linguistics is a focus on computation, on the derivation of results by a « mechanical » procedure, operating according to rules, according to an « algorithm ». A good tool for computation is, in many cases, a computer, but computational linguistics is not the same as Computer-based Linguistics or Linguistic Data Processing (*Linguistische Datenverarbeitung*).

Firstly, much computation can be and has been performed without computers. The choice of tools in, say, a statistical study is naturally a question of economy, not of scientific method.

Secondly, several studies of methodology, aiming at formulating the linguistic problems in a manner which makes them amenable to computation, do not involve actual computation, let alone the direct use of computers. The demarcation against other mathematical approaches to linguistics is necessarily unclear: for some papers on design of models, the emphasis on problems of computability is not indisputable.

Thirdly, linguistic research, like investigations in so many other fields, is often aided by the services of a computer without being, on that account, directed towards problems of computation. Thus lexicographic work is neither more nor less computational because the clerical part of it has become easier – or possibly more complicated – thanks to new equipment. The data processing performed in linguistic institutes of various kinds is certainly worth studying in its own right – preferably together with experts of economy, organization and office rationalization – but does not constitute a separate branch of scientific research. Again, the distinction is often vague in practice, and the Program Committee is aware that some papers may have interest as reports on computational tools for linguistics rather than as contri-

butions to Computational Linguistics proper. The Program Committee was careful and open in this respect, because of the intense interest in and need for such tools, at this point of time, in some fields.

Fourthly, Computational Linguistics does not, in our view, include the study of linguistics-based information processing in Information Retrieval Systems, Programming Language Compilers and other cases where linguistics is applied as an aid to computation, unless such study is concentrated on linguistically crucial problems.

The Program Committee was not in the position of initiating and controlling the research presented at the Conference. The authors obviously do not all share our view of Computational Linguistics as presented here. The Program Committee, by grouping the papers under a few headings, has tried to emphasize the various computational aspects, in a few cases more strongly than the authors have done themselves. It goes without saying, that many contributions could reasonably have been placed under more than one heading: semantical and syntactical analysis are often interlaced, and particularly so in some recent efforts; the meaning extraction procedures of Information Retrieval Systems come close to other semantic computations; Model Design is a component of very many contributions, and it is not intended as a ranking if that aspect has been considered more dominating in some papers. In short, the grouping under these headings is intended to characterize the field rather than the individual contributions.

Although the Program Committee in its arrangements of the papers for the Conference and hence for this publication did not obediently adapt itself to the contents of the papers but tried to influence the discussions at the Conference and the influx of papers at the next COLING Conference in an intended way, this arrangement was decided *a posteriori*, on the basis of the material submitted. The choice of headings reflects the over-all trends in the field. Conspicuously, there is a large number of papers on what we have called Semantic Computation. Not many years ago, that title might have sounded as *contradictio in adjecto*. The inclusion of Semantics into the domain of the computable seems to mark a major progress in recent linguistics.

H. KARLGREN

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INTRODUCTION

The Time, Place, and Nature of the Conference

The Proceedings consist of two volumes containing the texts of all the papers accepted for the 5th International Conference on Computational Linguistics, which took place at Pisa from 27 August to 1 September 1973 and was held in the *Palazzo della Sapienza*, the center of the University. The conference was sponsored by the *Consiglio Nazionale delle Ricerche* (CNR), the *Centro Nazionale Universitario di Calcolo Elettronico* (CNUCE), the University of Pisa, and the IBM Scientific Center of Pisa.

In his preface, B. Vauquois, President of the International Committee on Computational Linguistics, has described the history of the previous conferences, and H. Karlgren, President of the Program Committee, has explained the principles which were adopted in the choice and the division of the papers. It is my task to describe briefly the organizational aspects of the conference. First of all, however, I should like to make a few observations concerning its content in relation to recent developments in the area of automated language processing (ALP). I use this term rather than *computational linguistics* as it is far more general in its implications, encompassing all studies, theoretical or applied, on the use of computers or computational techniques in the processing of natural language.[1] I consider computational linguistics to be a subset of ALP, a subset to which I shall refer by the abbreviation CL.

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[1] See, for example, S. Lamb, *The Digital Computer as an Aid in Linguistics*, «Language», xxxvii (1961) 3, pp. 382-412, also *Linguistic Data Processing*, in D. Hymes (ed.), *The Use of Computers in Anthropology*, The Hague, 1965, pp. 159-188; J. Gardin, *A Typology of the Computer Uses in Anthropology*, *ibid.*, pp. 103-117. P. L. Garvin, *Computer Participation in Linguistic Research*, «Language», xxxviii (1962) 4, pp.385-389; C. A. Montgomery, *The 1969 International Conference on Computational Linguistics: A Progress Report*, «Computers and the Humanities», iv (1970) 3, pp. 193-198; D. G. Hays, *Applied Computational Linguistics*, in G. E. Perren, J. L. M. Trim (eds.), *Applications of Linguistics*, Cambridge University Press, 1971, pp. 64-84, and also *The Field and Scope of Computational Linguistics*, «The Finite String», ix (1972) 9-10, pp. 1-6; R. F. Barnes, Jr, *Computational Linguistics and Linguistics*, in *Research Trends in Computational Linguistics* (Centre for Applied Linguistics, Arlington, Virginia, 1972), pp. 1-6; and, in particular, the chap-

The complementary subset of computational linguistics (CL) is given the abbreviation TP, where TP is formed from the expression *text processing* which designs the nucleus of that subset.[2] Using these abbreviations we can obtain the equation TP = ALP – CL. Obviously, it is not possible to define clearly the boundary lines between CL and TP. CL activities, which are focused on linguistic algorithms, are principally directed towards the study of linguistic models, and in general, towards the formalization, representation, and calculus of linguistic structures. TP activities are mainly concerned with the processing of collections of language data, usually large, very often for purposes of reorganization, extraction, summarization, etc. of some linguistic elements of the text, designated at the ' surface ' level, i.e. distinguished by shape or code pattern.

It seems to me that one of the most valuable aspects of the 5th ICCL was that it, for the first time, intentionally, officially, and successfully brought together the experts from these two fields.[3] It could be said that the 5th ICCL underlined the complementary aspects of CL and TP.[4]

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ters dedicated to Automated Language Processing in the *Annual Review of Information Science and Technology*, edited by CARLOS A. CUADRA; attention is specially drawn to the article by D. WALKER in Volume 8 (1973), pp. 67-119, and the forthcoming article by F. J. DAMERAU.

[2] I take these two terms from the above article by D. Walker which was published about the same time as the 5th ICCL (1973).

[3] See the Call for Papers of the 1973 International Conference on Computational Linguistics.

The lectures will be concerned mainly with the following topics:

a) Informatic systems for the analysis and generation of linguistic structures. These systems can consist either of only a description language or can also contain the exploitation algorithm.

b) Practical experience of automatic treatment with the use of the preceding tools (analysis, generation of natural languages, man-machine communication, question-answering systems, mechanical translation, information retrieval, etc.).

c) Informatic systems for the analysis of texts and of linguistic data.

d) Practical experience of analysis of texts and linguistic data in various fields of linguistics and humanities (historical linguistics, lexicology, lexicography, terminology, quantitative linguistics, stilometry, stylistics, philology, textual criticism, dialectology, translation, popular traditions, documentary analysis of texts, psycholinguistics, etc.).

[4] The choice of topics announced in the Call for Papers for COLING 76, the 6th International Conference on Computational Linguistics, which will take place at Ottawa in the summer of 1976, substantially confirms the timeliness of this broadening of scope.

The following themes have been chosen for sections of the program:

1. General problems and methods of computational linguistics from the linguistic, the mathematical and the computational points of view.

2. Computational semantics I: deductive logic and artificial intelligence systems.

From a theoretical point of view, it must be remembered that many research projects currently in progress in TP are aimed at extracting, from linguistic facts, data and information which constitute the primary material that must be considered in theories and models of CL. At times, information obtained on the statistical and lexical composition of specific corpora is also used in the construction of algorithms and in the choice of working strategies for systems in CL; reference can be made, for example, to the use of statistical methods in several speech understanding systems or in some projects for machine translation. From an operational point of view, typical TP procedures include some crucial operations on the texts or data which are substantially the same as some of those requested from some components of typical systems in CL. Two of the more obvious examples are morphological analysis and the distinguishing of homographs for lemmatization.

The fact that these operations in TP are still performed manually is partly because of the inadequacies of the components of the CL systems in analysing, in a satisfactory manner, the variety and complexity of the texts and data usually processed in TP, but it is also a result of the lack of exchange of information and collaboration among researchers in the two fields. Those who have worked for some time in TP, however, are well aware of the fact that the development of applications according to the 'classic' methods and techniques of the 1950s and 1960s has reached saturation point. If we continue to use current methods, according to the current rules of the game (for example: processing, at a simple graphemic level, millions of running words, in order to produce frequency counts, concordances, lexical cards, etc., without any linguistic analysis), real prospects of development do not exist. Although the speed of the computer is continually being increased and programs are becoming more sophisticated, lexicographers and linguists are not able to profit from these facts proportionally because current methodology already produces much more data than any rea-

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3. Computational semantics II: semantics of natural languages.

4. Automatic syntactic parsing and synthesis of natural languages. Information retrieval. Man-machine communication.

5. Computational lexicography and stylistics, including concordances and statistical studies.

6. Speech recognition and synthesis; graphemics, including character recognition; language-graphics interfaces.

7. Machine translation and machine-aided translation; automated terminology dictionaries.

sonably sized team of linguists could possibly analyse, working according to current procedures. If the analysing operations are left to a successive phase, this would not alleviate the problem as it is not clear how we can resolve the enormous operational difficulties which are due to the sheer quantity of the documentation and material gathered.

It is a fact that after the 2nd International Summer School at Pisa (1972) where the participants were exposed at the same time to courses on both computer-aided lexicography and parser principles and techniques, attempts were multiplied to use the methods and techniques, studied by CL, in the field of TP, obviously with all the precautions, simplifications, and the limits imposed by the extent of the materials to be processed. An example which can be cited is the system for the automatic distinguishing, in large corpora, of homographs among the various parts of speech.

It is significant that this new attitude is shown above all in the field of the analysis of texts for lexicographical, statistical, stylistic, and literary studies. It is seen that in many of the papers in the sections of these Proceedings on *text corpus editing*, *text comparison*, and *grammatical analysis*, there is evidence of developments which would have been difficult to have foreseen only two or three years ago.

This trend can easily be detected also in the papers in the section on *meaning extraction*. It is well known that the difference between automatic translation and automatic documentation is that, in the latter, simple and well known surface working methods are able to offer an acceptable rendering, even if the process of textual analysis does not produce a linguistically adequate representation of the syntactic and semantic structure of sentences and paragraphs. Nevertheless, it seems clear that the possibility of applying linguistic knowledge to extract and represent, at least locally and partially, the structure and/or meaning of clauses and sentences, makes it possible to increase the efficiency of algorithms and retrieval strategies.

There is no doubt, however, that the natural meeting point for CL and TP is that represented by the *lexicology* section. On the one hand, the linguistic schools have recently formulated new abstract lexical models, thus enriching the already outstanding tradition of lexicology, particularly strong in Europe. On the other hand, in lexicography, attempts are being made to clarify the theoretical premises with the declared intention of transforming lexicography from an 'art' or 'technique' to an 'applied science'. Projects in which great machine dictionaries are planned should be considered within such a framework. A

machine dictionary is seen as an archive which is suitable for registering the body of knowledge produced by linguistic research in its dynamic development. This knowledge can be incorporated, for example, under the form of syntactic/semantic features, relationships of synonymy and antonymy, codes of semantic fields, case structures, possible constructions, rules of selection and co-occurrence, and must be able to be modified allowing both for the evolution of linguistic theories and the incorporation of additional data coming from the corpus. The frequencies of various linguistic units within the texts are recorded in the machine dictionary. These frequencies should permit an attempt to set up, on an inductive basis, the identification on the diachronic and synchronic axes of subsets of texts of quantitative homogeneous characteristics. Only in this way would it be possible to establish on a sounder basis the field of linguistic statistics which is to some extent in a state of theoretical crisis today despite the advances in technology.

With regard to *grammatical analysis*, automatic morphological analysis seems to have reached an advanced stage of development both in the optimization of algorithms and the extension of the lexicon covered in various languages.

As far as syntax is concerned, parsing systems are influenced by the general situation of transformational grammars. As is well known, a universally accepted model does not exist, and transformationalists usually limit themselves to the consideration of restricted even if highly complex groups of phenomena, each one proposing *ad hoc* modifications to the theory instead of clearly defining and completely specifying a class of grammars. The studies on augmented transition networks are probably the most relevant contribution in this field of CL, even at the theoretical level.

The situation is more favourable in a certain sense, however, for the development of algorithms which automatically generate sequences in the language of a given grammar from initial structures. These are useful both in verifying the generative power of a grammar and in the debugging of errors in the writing of a set of rules, as described in the section on *testing and simulation*.

The papers in the section on the *study of formal properties* show how these studies have been gradually widened to cover all the various levels of linguistics: phonological, morphological, syntactic, and semantic.

In the section on *discovery procedures*, the well known debate on the possibility of automating discovery procedures in linguistics was not

emphasized as on other occasions. Instead, the papers give concrete examples of computational procedures which can be of great assistance at the heuristic level of research projects.

In the *translation* section, the renewed theoretical involvement of the teams which continue to work in this much discussed field is clearly shown.

As I have already stated, the meeting of those carrying out research in the fields of CL and TP was one notable feature of the conference; the other was the emphasis placed on the area of semantics which was the theme of the two invited papers and also appeared as a topic in many papers, even those not included in the section on *semantical calculus*. The interest in semantic and pragmatic studies has been characteristic of the principal schools of theoretical linguistics in the early 1970s. The discussions on the problems of constructing and modelling 'intelligent' natural language understanding systems by those working in the fields of cognitive psychology, linguistics, information science, and artificial intelligence, have led to exciting new developments in our understanding of the *faculté de langage*. The 5th ICCL has probably provided the first official forum for the description of such researches which produces a new set of tools and knowledge in the field of natural inference, semantics formalization, knowledge representation, memory models, etc. Such a conceptual framework emerging into CL from the field of artificial intelligence is beginning to have an influence on the theoretical positions of the schools of contemporary linguistics; influence which seems to be much stronger and more profound than that of CL in the past. In one sense it is possible to say that, at least as far as this field is concerned, the traditional relationship between linguistics and CL, which sees CL as applying already formed linguistic theories, or at most attempting to give a complete specification of them, is being changed: linguistics is receiving new ideas and suggestions from developments in CL and artificial intelligence.

Organization of the Conference

Participants

There were 328 scholars from 34 countries who participated in the Conference. Some of these countries were represented for the first time at an ICCL meeting. Participants were from the following countries:

Australia 1, Austria 2, Belgium 12, Bulgaria 3, Canada 16, Czechoslovakia 5, Denmark 6, Finland 3, France 43, Germany 66, Greece 1, Holland 9, Hong Kong 1, Hungary 7, India 2, Israel 2, Italy 61, Ivory Coast 1, Japan 3, Norway 6, Poland 3, Portugal 2, Republic of Zaire 1, Rumania 2, South Africa 1, Spain 6, Sweden 8, Switzerland 5, Turkey 1, Uruguay 1, United Kingdom 15, USA 25, USSR 5, and Yugoslavia 3. Attendance was nearly double that of previous meetings.

Program

The texts received in response to the Call for Papers published in February 1973 were submitted to the scrutiny of the Program Committee (see p. v) which accepted 111 papers.

In the opening ceremony, which took place on the morning of 27 August, speeches were made by G. Scaramuzzi on behalf of the University of Pisa, G. Capriz on behalf of CNR, T. Bolelli on behalf of the *Comitato Scientifico*, G. Torrigiani on behalf of CNUCE, and B. Vauquois on behalf of the International Committee on Computational Linguistics. (Transcripts of their speeches can be found on pp. xxiii-xxxvii). Following the reception offered by the University of Pisa, the two invited papers were read in a plenary session which was presided over by C. G. Cecioni who welcomed the participants on behalf of the *Comitato Nazionale per le Scienze Storiche, Filosofiche e Filologiche* of CNR. In order that all of the 110 accepted papers could be presented within the time allotted, two parallel sessions were conducted throughout the duration of the conference. Each communication was allowed 30 or 40 minutes according to the degree of generality of its content. August 29 was devoted to a sight-seeing visit of Volterra with a formal welcome by the Mayor of that city. The Mayor of Pisa received the participants in the *Sala delle Baleari* on the evening of 30 August. C. A. Mastrelli, President of the *Società Italiana di Glottologia*, welcomed the participants on behalf of Italian linguists and the *Accademia della Crusca*. An organ recital was held in the *Chiesa dei Cavalieri* for the benefit of the participants on the evening of 30 August. At the concluding banquet, on the evening of 1 September, T. Bolelli greeted the participants on behalf of the Rector of the University of Pisa. B. Vauquois, as President of the International Committee on Computational Linguistics, closed the conference.

Throughout the conference, the CNUCE computers, in particular the IBM 360/67 and the IBM 370/155, were at the disposal of the

participants for demonstrations and other work. In fact, the programs described in the papers of I. Bátori, J. Courtin and G. Veillon, B. Henisz-Dostert and F. B. Thompson, G. Ferrari, M. Quézel-Ambrunaz and P. Guillaume, M. Pêcheux, C. Cipolli and A. Calabrese, were all demonstrated on the computer.

Organization of the Proceedings

The Proceedings are published in two volumes which contain the texts of the two invited papers and all the papers accepted for the conference, including those whose authors were unable to attend at the last moment.

The Program Committee grouped the presentations into eleven sessions:

I Study of Formal Properties
II Testing and Simulation
III Discovery Procedures
IV Lexicology
V Text Corpus Editing
VI Semantical Calculus
VII Quantitative Description of Language Systems
VIII Grammatical Analysis
IX Meaning Extraction
X Translation
IX Text Comparison

The first volume of the Proceedings consists of sessions I to VI; the second volume contains sessions VII to XI. The two invited papers (I. A. Mel'čuk and W. A. Woods) were included in sessions VIII and VI, respectively. Within each session the papers have been printed in alphabetical order of the authors' names (the name of the first author has been used in cases where there was more than one). Each volume has an index of the papers contained within that volume and, in addition, Volume 2 has a general index. As far the rules and criteria, which guided the Program Committee in their decisions, reference should be made to the preface by its President H. Karlgren. A brief index of themes, compiled with many suggestions from H. Eggers and A. Tomberg, can also be found at the end of the second volume. This list makes no attempt at classification and serves only to assist the reader in finding certain topics.

ACKNOWLEDGEMENTS

As General Co-ordinator of the 5th ICCL, I should like to express my deep gratitude to the *Consiglio Nazionale delle Ricerche*, CNUCE, and the IBM Scientific Center of Pisa who jointly financed the organization of the conference.

In particular, I wish to thank A. Faedo, the President of CNR and Director of CNUCE, and G. Torrigiani, the Secretary of the Board of Directors of CNUCE, who, showing a clear appreciation of the necessities, the goals, and the aspirations of our discipline, have established a Division of Linguistics at CNUCE. This Division has been responsible, to a great extent, for the rapid development of linguistic and literary computing in Italy. I should also like to thank all the members of the Scientific Committee for their valuable advice and assistance in the organization of the conference; the *Società Italiana di Glottologia* and its President, C. A. Mastrelli, and Secretary, R. Lazzeroni, and the *Società di Linguistica Italiana* and its President, P. Ramat, and past-President, T. De Mauro, for the help they gave for the Italian participation at the conference; and, of course, the Program Committee and in particular its President, H. Karlgren, for their intensive work in selecting and classifying the papers.

It is also my pleasant duty to express my gratitude to all those who have contributed to the success of the conference: the Organizing Committee and all the local authorities who helped in providing hospitality for the participants, and particularly R. Stefanini who was responsible for the co-ordination of the facilities generously placed at our disposal by the University of Pisa; all the personnel of the Linguistics and EDP sections of CNUCE, particularly P. Bronzoni and E. Picchi who organized the demonstrations using the computer, all the secretarial staff of the conference with special mention for the co-ordinator, L. Bertoni, and for B. Ghelarducci and M. Pistelli. Thanks are also due to G. Ferrari who co-ordinated the work involved in the preparation of the preprints, assisted by N. Catarsi, M. L. Ceccotti, L. Pecchia, I. Prodanof, D. Ratti, G. Stilli, and G. Turrini.

I must also thank CNUCE who gave financial support towards the publication of the Proceedings. N. Calzolari Zamorani of the Linguistics Division of CNUCE and European Secretary of the International Committee on Computational Linguistics has been responsible for the initial editing of the texts, the compilation of indexes, and the

co-ordination of the correcting of the proofs,[5] and I thus feel it only right that her name should be associated with the editorship of these volumes. I should like to express my particular gratitude to the publisher, L. S. Olschki, for the special care taken in the publication of these Proceedings.

A. ZAMPOLLI

Pisa, 1 October 1973[6]

[5] The correction of the first and second proofs was entrusted to students at the University of Pisa. The third proofs, however, were sent to the authors in order to receive their final approval.

[6] The notes have been added after this date.

OPENING ADDRESSES

Autorità, Signore, Signori,

porgo il più cordiale benvenuto ai partecipanti alla *International Conference On Computational Linguistics.*

L'organizzazione di questo Congresso, che segue quelli tenutisi a New York, a Grenoble, a Stoccolma, a Debrezen, è stata affidata al Prof. Antonio Zampolli dell'Università di Pisa dall'*International Committee on Computational Linguistics*, un Comitato di insigni studiosi di diverse nazionalità che ha il compito di promuovere gli studi, le ricerche e gli scambi di informazioni nel settore della elaborazione elettronica di dati linguistici.

Questo settore ha delle caratteristiche spiccatamente interdisciplinari. In esso confluiscono i risultati di discipline umanistiche, quali la linguistica, la filologia, la storia letteraria, di scienze come la matematica e l'informatica, e della moderna tecnologia dei calcolatori.

Questo settore della ricerca è perciò in continuo sviluppo e richiede un rapido aggiornamento: il Congresso cui vi accingete ad assistere si propone di rispondere a queste esigenze, e siamo grati al Consiglio Nazionale delle Ricerche, alla IBM Italia, e al Centro Nazionale Universitario di Calcolo Elettronico dell'Università di Pisa che ne hanno assunto il patrocinio.

L'Università di Pisa ha promosso e largamente contribuito allo sviluppo di queste ricerche in Italia, in diversi modi, con diverse iniziative, per mezzo di alcuni suoi Istituti.

Queste attività si sono sviluppate così rapidamente da costituire ben presto una delle principali e notevoli attività del Centro Nazionale Universitario di Calcolo Elettronico dell'Università di Pisa.

Io sono grato al Prof. Antonio Zampolli, che è stato il promotore e l'animatore di questi studi, e all'Accademia della Crusca, e in particolare al suo presidente Giovanni Nencioni, che, chiedendo la collaborazione del nostro Centro, ci ha permesso di intensificare i nostri studi e la nostra attività in questo campo. Questi studi e questi interessi hanno trovato piena accoglienza e collaborazione da parte dei colleghi della Facoltà di Lettere dell'Università di Pisa, e in particolare del Prof. Tristano Bolelli.

La Facoltà di Lettere dell'Università di Pisa ha infatti istituito, per prima in Italia, un corso ufficiale di Linguistica matematica il cui insegnamento è stato affidato al Prof. Zampolli.

Un'altra attività didattica che Pisa ha introdotto, prima tra le Università italiane, è il Corso di Laurea in Scienze dell'Informazione, che sta per entrare nel sesto anno di vita. L'esempio è stato seguito da altre Università italiane, cominciando da Bari e da Torino.

Gli studi da voi prediletti hanno conosciuto in breve tempo un grande incremento e un rapido sviluppo.

Nel 1968 il Prof. A. Zampolli era solo in questa attività; oggi la Sezione Linguistica da lui diretta conta oltre trenta collaboratori.

Grazie alla collaborazione dell'Accademia della Crusca e di molti altri Istituti Scientifici italiani, la Sezione Linguistica del CNUCE ha messo a punto una serie di metodologie, di procedure, di programmi che costituiscono un potente strumento di lavoro e di ricerca a disposizione di tutti gli studiosi italiani e stranieri. I testi in più di 20 lingue, registrati su nastri magnetici, formano una grande biblioteca elettronica che fornisce una documentazione e un oggetto di grande interesse per i vostri studi.

L'organizzazione di questo Congresso si inserisce nell'attività che l'Università di Pisa, tramite la Sezione Linguistica del CNUCE, sta svolgendo da tempo sul piano dei rapporti internazionali.

Essa cura le relazioni scientifiche e lo scambio di informazioni e di materiali con altri paesi. Nel 1970 l'Università di Pisa organizzò una Scuola Estiva Internazionale sulla elaborazione elettronica dei dati linguistici e letterari. L'elevato numero dei partecipanti ha dimostrato che la Scuola rispondeva a una esigenza molto sentita tra i ricercatori linguistici e umanisti, e il successo didattico e scientifico ha indotto l'Università a rendere stabile la Scuola che si svolge con frequenza biennale.

Nel 1972 la Scuola ha registrato oltre 400 domande di iscrizioni provenienti da oltre 20 paesi europei e extraeuropei. Già è allo studio l'organizzazione della Scuola del 1974, che trarrà certamente grande beneficio dallo svolgimento di questo Convegno, che raduna a Pisa tanti insigni studiosi ricercatori ed esperti del settore.

Desidero ora rivolgere un saluto in inglese ai nostri graditi ospiti, riassumendo loro quanto ho detto in italiano.

Ladies and Gentlemen,

On behalf of the Rector of this University, Prof. Vincenzo Palazzolo, who deeply regrets not to be able to be present today at the opening Session of the fifth *International Conference on Computational Linguistics*, I want to extend the warmest welcome of the University of Pisa to the participants to this Conference.

I would like to summarize briefly the remarks I have made to the authorities and my Italian colleagues about the nature and the object of this Conference and the importance of the studies in this specific field of research.

I want also to thank the *International Committee on Computational Linguistics* for entrusting the organization of this Conference to Italy.

The University of Pisa has promoted and greatly contributed, by means of its various Institutes, to the development of this kind of research in Italy, in various ways and with various projects. These activities have developed so fast that they are now amongst the principle and most noteworthy activities of the National University Computing Centre at the University of Pisa, also by means of the direct and valued collaboration of the Crusca Academy, which is here represented by its illustrious President, Prof. Giovanni Nencioni.

These studies and interests have been fully accepted and assisted by our colleagues in the School of Letters of the University of Pisa, and in particular by Prof. Tristano Bolelli. Indeed the School of Letters of the University of Pisa was the first in Italy to introduce an official course in Mathematical Linguistics.

Another teaching activity, introduced at Pisa before any other Italian University, is the course in Information Science, which is now in its sixth year. In this way, your chosen field of study has undergone an expansion and swift development over a brief period of time.

The Linguistics Branch of our National University Computing Centre has the task of promoting and diffusing research and of giving scientific and technical advice to Institutes all over Italy which have projects in Computational Linguistics and the Humanities. Today there are over eighty Italian scientific Institutes, to which must be added a dozen Institutes in other countries, working in collaboration with the Linguistics Branch of our Computing Centre.

In 1968 only Prof. A. Zampolli, the promoter and leading spirit of these studies, was involved in these activities; today the Linguistics

Branch of the Computing Centre, under his leadership, has a staff of over thirty people.

The organization of this Conference joins activities that the University of Pisa, through the Linguistics Branch above mentioned, has been operating at a level of international cooperation. It is concerned with scientific relations and the exchange of material and information with other countries.

In 1970, the University of Pisa organized a Summer School dealing with the electronic treatment of linguistic and literary data. The large number of participants showed that the School responds to a much felt need amongst linguistic and humanist researchers. This educational and scientific success has led the University to make the School a permanent biannual event.

In 1972, the School received over four hundred applications from 20 countries, in Europe and beyond. The organization of the 1974 School is already underway; no doubt it will greatly benefit from this Conference, which brings together here in Pisa all the notable experts and researchers in this field.

I thank all of you who have honored us by coming here. Let me say I am sure that this Conference will be very fruitful and will make an important contribution to the promotion and further diffusion of these studies in Italy and in your own countries.

I really hope that the time you are going to spend in the peaceful and intimate atmosphere of this ancient University, so rich in cultural traditions, will allow you to have a profitable exchange of ideas and experience.

A questo punto, ho ritenuto di esprimere agli illustri ospiti stranieri – cosa che estendo naturalmente a tutti i partecipanti a questo Congresso – la certezza che i Vostri lavori avranno il migliore successo e costituiranno un valido e sicuro contributo all'ulteriore diffusione e potenziamento di questi studi in Italia e negli altri Paesi, con l'augurio che la particolare atmosfera di questa antica Università, così ricca di tradizioni culturali, possa ancor più facilitare un proficuo scambio di idee e di esperienze.

Vi ringrazio. Thank you very much.

G. SCARAMUZZI
Pro-Rettore dell'Università di Pisa

Professor Faedo has asked me to take his place in this opening session and to welcome you to Pisa on his behalf; mine is a rather difficult task because Professor Faedo would have filled, here, at least a double role: that of President of the Italian National Council of Research (C.N.R.) and that of founder and director of the Centro Nazionale Universitario di Calcolo Elettronico (CNUCE). Both organizations in the last five years, have had a part in the development of computational linguistics in Italy; a part that merits a quotation here. To make my task easier a brief report about the activities of the CNUCE will be given to you later by Professor Torrigiani.

The Italian National Council of Research carries most of the financial burden which derives from the use of computers in linguistic, literary and, more generally, humanistic research. The council's support occurs either through the Research Centres instituted by the special Committee for philosophy, history and philology or through contributions to Institutes in many Italian Universities. There are now more than fifty projects underway and they cover a vast range of disciplines: some of the work has been already mentioned this morning; other projects will be certainly quoted during the Conference. Of major importance are the lexicological and lexicographical projects in particular those which have as a goal the collation of great vocabularies. Let me mention here, in particular, the work around the " Treasury of the Italian Language from the Origins " and the great " Historical Dictionary for the Italian Language " which the National Council of Research supports through the " Accademia della Crusca ". Texts of all centuries and of many literary genres (so as to cover the whole span of Italian literature) are examined from the linguistic, stylistic and stylometric points of view. Work is not restricted to written and literary texts, but expands over the great variety of Italian dialects. Part of the work is of interest to sociology and pedagogy: I mention here the research on the vocabulary of schoolchildren, especially of those children who have moved with their families from the south of Italy to the cities in the North. Within the Italian automatic lexicon more than 100.000 lemmas have been recorded already, together with many of their relevant properties. Thus the foundations are laid for an Italian " banque de mots ".

Ho il gradito compito di porgere il benvenuto della città e dell'amministrazione provinciale ai partecipanti alla *International Conference on Computational Linguistics.*

Pisa è un'antica città, l'Università di Pisa è un'antica Università; la vita della nostra città è inconcepibile senza il rapporto continuo e costante con l'Università, al punto che più andiamo avanti, più ci rendiamo conto di come la vita della nostra città si lega sempre più profondamente alla vita dell'Università di Pisa. È per questo che il saluto degli amministratori della città e della provincia di Pisa è un saluto che assume un valore particolare. Noi ci rendiamo conto dell'importanza che hanno manifestazioni come queste. Le sosteniamo, nella convinzione che rappresentino veramente delle tappe importanti, culturalmente e socialmente.

È con questo spirito, con questa cordialità, con questa coscienza dell'importanza del convegno, che noi amministratori della città porgiamo il benvenuto. Noi ci auguriamo che l'ambiente cittadino, la tradizionale ospitalità, tutto ciò che ci circonda, la nostra vecchia storia, legata, come dicevo prima, all'Università, confortino questo lavoro, e che i nostri Ospiti trovino la possibilità di proficui contatti e di una ottima attività scientifica. Non voglio aggiungere altre parole, anche perché avremo modo, come amministratori, di incontrarci direttamente nella sede del Palazzo Comunale. Mi limito semplicemente a porgere di nuovo gli auguri di un buon lavoro.

E. LAZZARI
Sindaco di Pisa

Studies (involving about 20 million words) are underway also on other languages: latin (classical, medieval, and humanistic), hittite, assiro-babylonian (in collaboration with the UCLA), and then English, French, Spanish and Catalan, Rumanian, Russian, German, etc. Some projects are of interest for archeologists and historians.

I have quoted so far work supported by one of the committees of the C.N.R. but other committees are interested too in the computer processing of linguistic data. I must mention at least one important initiative of the Istituto per la Documentazione Giuridica of the C.N.R.: the " Historical Dictionary of the Italian Juridic Language ".

The work supported by the C.N.R. goes on in many Italian Universities: Torino, Milano, Pavia, Padova, Venezia, Genova, Parma, Bologna, Urbino, Chieti, Roma, Salerno, Cagliari, Palermo, Catania. A large proportion of the work however is carried out in Florence and Pisa. In Florence is the seat of the Accademia della Crusca; this Academy has the merit of having lent its great prestige to the new linguistic work. Here in Pisa, as you have heard, the Linguistic Branch of the CNUCE provides the computer backing required for most projects and adds its activity to that of the Institutes of the faculty. Actually the computer processing for all the projects I have mentioned is carried out in Pisa at the Linguistic Branch of the CNUCE under the direction of the coordinator of this congress, Professor Zampolli. So I must say a few words about the Centre, without, however, entering into technical and organizational details, which I will leave to Professor Torrigiani. The creation and development of the CNUCE is due to some essential factors acting together. First of all, a relatively long Pisan tradition of studies in computer science, over twenty years, particularly at the Institute of Information Processing of the C.N.R.; secondly, the courage of the University (Italian Universities are hampered by rather antiquated rules, and the difficulties to be surmounted to follow up modern developments are really very great); then, of course, the generosity of IBM which was directly involved in creating the CNUCE and in supporting its activity and finally, of course, the hard work of all directly concerned. Our point in mentioning the CNUCE is because not only has it been instrumented in allowing this meeting to take place, but also because the C.N.R. has recently taken a pledge to support fully, in the future, the activity of the CNUCE.

The C.N.R. is also directly helping in the organization of this Congress through its office for international relations. An international meeting, where so many nations are represented, gives us a renewed

pleasure for many reasons: it shows friendly collaboration, agreement about tasks to be pursued, the exchange of the results of experiences over barriers which are often more traditional than efficient. But there is, perhaps, also another motive of satisfaction which comes from a cursory exploration of the programme. This doesnot only show the acceptance on the part of Humanists and Linguists of novel techniques; it also shows a surprising getting together of types of research, which some traditions prefer to keep apart: the logical formal approach (which is pursued in Italy so far mainly by experts in computer science) and the more strictly humanistic one. The circumstance is particularly satisfying for Professor Faedo for two reasons; on the one hand, because he has worked hard for years to encourage computer research and applications in general and, on the other hand, because, as an organizer, he sees the importance of the interdisciplinary approach to research problems.

So, on behalf of Professor Faedo, I welcome you all to Pisa.

G. CAPRIZ
C.N.R.

Ladies and Gentlemen,

In my capacity as Director of the Linguistics Department in this University I have the privilege, on behalf of the Scientific Committee and of myself, to welcome the participants in 1973 *International Conference of Computational Linguistics.*

After the meetings in New York, Grenoble, Stockholm and Budapest-Debrecen, the *International Committee* decided to hold the Conference this year in Pisa, recognizing the development of Computational Linguistics in our Country and especially in our city.

Such a big number of prominent scholars coming from every part of the world is a token of success.

The different sections of this Conference, including Study of Formal Properties, Testing and Simulation, Discovery Procedures, Organization of Linguistic Data (Lexicology, Text Corpus Editing, Semantical Calculus), Quantitative Description of Language Systems, Grammatical Analysis, Meaning Extraction, Text Comparison, are the main fields of Computational Linguistics today and will be dealt with during five days.

Linguistics is becoming more and more difficult every day and meetings like this Conference are necessary to share experiences and to improve different approaches to our science.

Last year, on the occasion of a Course in Electronic Elaboration of Linguistic Data, I quoted one of my best professors, the late Joseph Vendryes.

He said, in 1948, at the end of an International Congress of Linguistics: " Ayons confiance. Au moment de nous séparer, ma pensée va de nouveau vers les jeunes gens qui représentent l'avenir. Je me dis, en reprenant un mot de Voltaire dans sa vieillesse: les jeunes linguistes sont bien heureux; ils verront de belles choses ".

Since that time, many discoveries have been made, many trends have appeared, many studies in new fields have been published. Linguistics has been considered the leading science and its borders have been extended to many other sciences in a mutual exchange. First of all, Computational Linguistics has tried to give an original contribution to old problems and has proposed new questions; this is the reason for this Conference, sponsored by the Consiglio Nazionale delle

Ricerche, by the Centro Scientifico IBM of Pisa and by the Centro Nazionale Universitario di Calcolo Elettronico of Pisa University under the direction of Professor Alessandro Faedo with the co-operation of many scholars: among them I would like to mention Professor Torrigiani and Professor Zampolli, teacher of Computational Linguistics in my Department.

I am sure that this Conference will be successful and that each participant will return home persuaded that he has improved his knowledge of essential problems and more and more convinced that science cannot advance without confronting our own results with those of our colleagues even if our particular field is somewhat different.

Many schools are working in Linguistics and nothing can be lost of the experience of other scholars.

In name of the internationality of scientific thought and of the co-operation among scholars of different countries, I wish that the days spent in Pisa will be both useful and pleasant and a big experience for each participant.

T. BOLELLI
Direttore dell'Istituto di Glottologia
dell'Università di Pisa

Mesdames, messieurs, Autorités, chers amis et collègues,

avant tout, j'ai le devoir de vous donner connaissance de quelques messages qui nous ont été envoyés; je choisis parmi eux celui de monsieur Bucalossi, ministre de la Recherche Scientifique, monsieur Malfatti, ministre de l'Instruction Publique, du Président du Conseil de la Région Toscane, monsieur Gabuggiani, de monsieur Cacciavillani, directeur général adjoint de IBM. Ces autorités nous expriment le regret de ne pouvoir suivre les travaux de notre congrès et formulent pour les travaux du congrès les souhaits les meilleurs.

Comme monsieur Capriz vient de le dire, je dois vous transmettre les souhaits et les voeux de monsieur Faedo en tant que directeur du Centre National Universitaire de Calcul Electronique, mais ce n'est pas seulement en son nom que j'ai le plaisir et l'honneur de vous souhaiter la bienvenue ici, à Pise, mais si vous le permettez, c'est aussi au nom du Centre, au nom de mes collaborateurs, surtout des membres de la Section Linguistique, de tous ceux qui ont vu dans le choix qui est tombé sur Pise, le choix pour le siège de ce Congrès, une manière par laquelle votre association a bien voulu reconnaître ce qu'en quelque manière nous avons cherché à faire durant ces dernières années, dans le domaine de la linguistique automatique. C'est pour cela, cher monsieur Vauquois, que je vous remercie bien vivement. Je veux saisir l'occasion de remercier encore monsieur Cecioni en tant que membre du Comité 08 du Conseil des Recherches qui a très soigneusement suivi l'organisation de ce congrès et les perspectives futures de la recherche dans le domaine de la linguistique automatique.

Ce que le CNUCE a essayé de faire dans le domaine de la linguistique, il n'est pas si facile de le dire dans les quelques minutes qui sont réservées, comme d'habitude, au salut de bienvenue, au commencement d'un congrès. Mais puisque l'histoire de la Section Linguistique coïncide presque complètement avec l'histoire du CNUCE, je dois dire qu'en 1966, dans le cadre des travaux de l'Index Thomisticus et surtout du Grand Dictionnaire de la Crusca, on a commencé à utiliser les ordinateurs du CNUCE pour réaliser les dépouillements automatiques prévus par ces deux programmes de recherche. D'autres instituts suivirent bientôt cet exemple et en 1968 les projets d'emploi des ordinateurs étaient si nombreux que nous avons décidé de constituer une Section

Linguistique qui d'une part encouragerait les recherches et les études originales et qui d'autre part mettrait à la disposition des humanistes intéressés non seulement les ordinateurs et le personnel technique nécessaire pour l'exécution des opérations, mais aussi permettrait la consultation scientifique, l'analyse, la rédaction de nouveaux programmes lorsque les programmes généralisés ne seraient pas suffisants.

Les instituts universitaires et les instituts de recherche italiens et étrangers qui mènent des recherches dans le secteur humaniste auprès du CNUCE sont aujourd'hui plus de 80 et ils ont enregistré et élaboré électroniquement non moins de 90.000.000 mots dans plus de 20 langues. Les avantages scientifiques et économiques offerts par le rassemblement des projets sont remarquables surtout au point de vue de la standardisation des méthodes. Pensez par exemple que l'adoption d'un même système général d'enregistrement et d'élaboration permet d'utiliser des programmes déjà expérimentés tout en laissant à chaque chercheur la possibilité d'utiliser chaque nouveau programme écrit pour un projet et tout en autorisant l'échange entre divers instituts. En pratique, un chercheur peut mener ses recherches dans une grande bibliothèque électronique à traitement automatique et non plus sur le seul texte que lui-même a enregistré. D'autre part, la présence d'un corpus si étendu incite les chercheurs qui entreprennent des recherches à adopter les standards que nous proposons. Ils sont les résultats d'expériences collectives menées depuis plus de dix ans et comportent un schéma d'enregistrement et d'élaboration bien formulé. Ceci exige que l'on ne néglige pas les informations qui, bien que n'étant pas immédiatement nécessaires pour la recherche spécifique proposée, sont toutefois indispensables pour garantir l'utilisation des matériaux de la part des autres chercheurs.

Vous voyez donc que l'attitude particulière du CNUCE à l'égard de la linguistique automatique a non seulement consenti à donner à la Section Linguistique une organisation de standardisation, très correcte au point de vue méthodologique, mais surtout a permis de faire du CNUCE le centre, le pôle, si vous voulez, des différentes recherches dans le domaine de la linguistique automatique dans notre pays et dans une certaine mesure, dans le domaine de la linguistique automatique en Europe et même en dehors de l'Europe.

Ce que nous avons dû faire comme conséquence de ce choix qui était avant tout un choix politique, de politique scientifique naturellement, c'était que chaque fois que nous avons dû adopter un choix au point de vue technologique – par exemple un choix pour l'acqui-

sition de nouvelles machines – alors les programmes et les exigences des recherches linguistiques, la manière dont ces exigences devaient être servies – même du point de vue dimensionnel – ont prévalu: ce choix a été influencé par les exigences de la Section Linguistique.

Il fut un temps où nous utilisions le 1401, puis nous avons pris le premier exemplaire du 360. Au fur et à mesure que le CNUCE croissait, que la Section Linguistique croissait, nous étions forcés de changer notre équipement et nous le changions à chaque fois avec une exacte et très rigoureuse évaluation de ce que nous devions faire dans le domaine de la linguistique. Au fur et à mesure que le CNUCE croissait, nous avons changé de machines, de personnel et surtout de philosophie. Comme le représentant de monsieur le Recteur vient de le dire, ce que nous avons fait dans ce domaine, nous l'avons déposé dans les Ecoles d'Eté qui, avec une fréquence biennale, sont organisées à Pise. La dernière édition a vu 400 inscriptions et 50 conférenciers de 32 pays.

Et bien je disais qu'on a changé aussi, non seulement de machines, non seulement de personnel, mais surtout de technologie et de philosophie; en disant cela je pense à l'influence qu'ont eu les exigences de la Section Linguistique dans le choix du *time-sharing*, dans le choix du 360/67, ce qui a permis avec la technologie des machines virtuelles de multiplier la puissance physique de la machine et surtout d'introduire une méthode conversationnelle qui devait se révéler précieuse non seulement pour les exigences du *debugging* dans le domaine traditionnellement lié au *data-processing*, mais surtout pour le travail spécifique des chercheurs dans le domaine de la linguistique automatique.

Un congrès est à la fois l'occasion d'une revue des résultats que l'on a acquis et une définition des propos pour l'avenir. Autrement dit le congrès, un congrès comme cela, est l'occasion pour nous tous de prendre conscience des problèmes qui viennent à la surface. Je ne prétends absolument pas les indiquer: ils sortiront de vos travaux, des communications, des relations, des discussions surtout; pas seulement des discussions qui auront lieu dans le cadre du congrès, mais de celles qui ne sont moins pas fécondes que les officielles: les discussions qui ont lieu dans les couloirs des congrès.

Mais consentez-moi, mesdames messieurs, au moins une indication, une indication dimensionnelle si vous voulez.

La communauté des chercheurs dans le domaine de la linguistique en général et de la linguistique automatique en particulier – domaines qui sont de jour en jour plus liés entre eux – vient d'acquérir une dimension sur le front scientifique qu'il ne serait pas flatteur de définir im-

posante. Et alors, si nous pensons à la dimension de cette communauté, si nous pensons à la dimension qualitative et quantitative des problèmes avec lesquels nous avons à faire, si nous pensons aux conséquences que ces dimensions qualitatives et quantitatives ont sur le plan technique, technologique et scientifique, alors nous devons dire que les techniciens purs, les informaticiens purs et – pourquoi ne pas le dire – les maisons constructrices doivent compter avec nous. Ils doivent prendre conscience que, quand on discute par exemple – je prends seulement un exemple, je ne veux absolument pas donner une indication de priorité à ce que je vais dire – sur le problème de l'entrée des données, on doit penser que ce que vous faites et ce que feront ceux qui marcheront après vous, par exemple dans le domaine de la documentation juridique, doit conditionner les choix techniques et je dirais même les choix de fabrication. Je ne veux pas penser en ce moment aux mémoires à laser qui nous réserverons peut-être dans les années 80 de nouveaux moyens complètement différents et qui peut-être nous obligeront à révolutionner nos méthodes et l'organisation de notre travail. Je pense aux moyens d'entrées de données, aux autres moyens de mémorisation, qui doivent être non seulement une délicatesse pour les spécialistes, mais qui doivent être exploités par vous, par nous, par tous ceux qui – dans ce que je voudrais appeler la société civile – devront utiliser vos découvertes, vos recherches, vos efforts.

Et bien, c'est en soulignant les liens très étroits qui existent entre la recherche pure, la recherche scientifique que vous poursuivez et les conséquences dans l'activité de la société industrielle, de la société tout court, et en soulignant la grande importance qu'a sous ce point de vue le domaine que vous exploitez, le domaine que vous cultivez, que je vais renouveler avec grand plaisir, avec l'expression de ma gratitude pour l'honneur que vous nous avez fait en choisissant Pise comme siège de votre congrès, les voeux et les souhaits les plus vifs et les plus cordiaux pour les résultats de vos travaux, pour les résultats de votre séjour à Pise.

Mesdames, messieurs, merci.

G. TORRIGIANI
Segretario generale del CNUCE

Dopo gli Stati Uniti, la Francia, la Svezia, l'Ungheria, abbiamo il piacere di ricevere l'ospitalità dell'Italia. In questo paese, mi sembra che non si potesse trovare un luogo migliore per organizzare questo Convegno, infatti da tempo era già ben nota l'attività scientifica della Sezione Linguistica del CNUCE e la sua attività didattica; in particolare la Scuola Estiva Internazionale e la Elaborazione Elettronica di Dati Linguistici e Letterari. A nome dell'International Committee for Computational Linguistics io desidero ringraziare calorosamente tutti gli Istituti e gli Enti che hanno contribuito all'organizzazione e ad assicurare la qualità scientifica e la redazione del Congresso. Innanzi tutto le tre Istituzioni che hanno concesso il loro patrocinio al Congresso: Il Consiglio Nazionale delle Ricerche e in particolare il suo Presidente Prof. Alessandro Faedo, qui rappresentato dal Prof. Capriz e il Prof. C. Cecioni; l'IBM Italia qui rappresentata dall'Ing. Marconi; il Centro Nazionale Universitario di Calcolo Elettronico qui rappresentato dal Prof. Torrigiani. Ringrazio particolarmente l'Università di Pisa per l'aiuto concesso all'organizzazione e per la cortese ospitalità. Ringrazio il Comune di Pisa che ci ha accolto così generosamente in questa bella città e gli Enti che hanno collaborato per rendere più gradevole il nostro soggiorno e più fecondo il nostro lavoro. E cioè: l'Amministrazione Provinciale, la Camera di Commercio Industria Artigianato e Agricoltura, l'Ente Provinciale per il turismo e l'Ente autonomo di Tirrenia. A tutti i loro rappresentanti invio ancora il vivissimo ringraziamento per aver così largamente contribuito alla riuscita del nostro Congresso. A lei, Prof. Zampolli, nostro brillante coordinatore generale, che non ha risparmiato il suo tempo per il nostro Congresso, e a tutta l'equipe che ha collaborato con lei, va tutta la nostra gratitudine.

B. VAUQUOIS
Presidente dell'ICCL

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