



# THE FINITE STRING



NEWSLETTER OF THE ASSOCIATION FOR COMPUTATIONAL LINGUISTICS

VOLUME 13 - NUMBER 3

MAY 1976

The members and Executive Committee of the Association will soon have to choose among limiting the scope of the Journal, making its content more compact and its content more concise, or increasing dues. The production budget allows for no more than 20 fiches per year. The rate of arrival of acceptable manuscripts and news that's fit to print is going above the level that can be accommodated in that budget. Members who prefer one of the three recognized courses of action, or who have another to propose, can write to the Editor, the President, or any member of the Editorial Board or Executive Committee.

AMERICAN JOURNAL OF COMPUTATIONAL LINGUISTICS is published by the Center for Applied Linguistics for the Association for Computational Linguistics.

EDITOR: David G. Hayes *Professor of Linguistics, SUNY Buffalo*

EDITORIAL ASSISTANT: William Benzon

EDITORIAL ADDRESS: *Twin Willows, Wanakah, New York 14075*

MANAGING EDITOR: A. Hood Roberts *Deputy Director, Center for Applied Linguistics*

MANAGEMENT ASSISTANT: James Megginson

PRODUCTION AND SUBSCRIPTION ADDRESS: *1611 North Kent Street, Arlington, Virginia 22209*

Copyright © 1976

Association for Computational Linguistics

## TABLE OF CONTENTS

PERSONAL NOTES . . . . .	3
1976 NATIONAL COMPUTER CONFERENCE . . . . .	4
NIMH: TECHNICAL HELP FOR PROPOSERS, MINORITY PROGRAMS .	5
NSF: FOREIGN CURRENCY PROGRAM--EGYPT, INDIA, PAKISTAN .	6
CATASTROPHE THEORY: THOM AT SIAM MEETING . . . . .	7
NATO: ADVANCED STUDY INSTITUTES . . . . .	8
STRUCTURAL-PROCESS THEORIES OF BEHAVIOR . . . . .	8
MAN-COMPUTER INTERACTION . . . . .	9
COMPUTER-BASED SCIENCE INSTRUCTION . . . . .	10
C. S. PIERCE INTERNATIONAL CONGRESS . . . . .	11
NEW JOURNAL: COGNITIVE SCIENCE . . . . .	12
NSF: REJECTED PROPOSALS & RECONSIDERATION . . . . .	13
CONFERENCE CHRONICLE . . . . .	14
1976 LINGUISTIC INSTITUTE, OSWEGO, NEW YORK . . . . .	15
BAAL: SEMINAR ON TRANSLATION AT ESSEX, ENGLAND . . . . .	19
INDEXING IN PERSPECTIVE SEMINAR AT WARSAW . . . . .	20
NFAIS OFFICERS 1976-77 . . . . .	21
EXPERIMENTS WITH A POWERFUL PARSER (REPRINT)     Martin Kay	22
AFIPS WASHINGTON REPORT (REPRINT, 1975-76 ISSUES) . . . . .	53

PERSONAL NOTES

---

JAIME CARBONELL MEMORIAL

A Japanese translation of REPRESENTATION AND UNDERSTANDING is in preparation, dedicated to Carbonell's memory. This edition will include a paper signed by Carbonell and Collins, published posthumously in AJCL

---

BRUDERER, HERBERT    New address: Finkenweg 3, 3110 Münsingen,  
Switzerland

NOVAK, GORDON S , JR.    PhD in Computer Science, University of  
Texas, Austin, for a thesis entitled COMPUTER UNDERSTANDING  
OF PHYSICS PROBLEMS STATED IN NATURAL LANGUAGE

1976 NATIONAL COMPUTER CONFERENCE

NEW YORK HILTON HOTEL AND COLISEUM

JUNE 7 - 10

TWENTY-FIFTH ANNIVERSARY. The first Joint Computer Conference was held December 10-12, 1951, in Philadelphia. Ten large-scale computers were described: UNIVAC, Burroughs, IBM CPC, ORDVAC, ERA 1101, MARK III, Ferranti-Manchester, Whirlwind I, EDSAC, NBS SEAC. Bell Labs was in the field. 877 attended.

KEYNOTE ADDRESS. J. Paul Lyet, Chairman of Sperry Rand Corp.

PUBLIC ACCESS TO COMPUTERS: Tuesday 8 June. David Ahl, chmn. Public attitudes toward computers, Personal computers, Access.

INTERNATIONAL PLENARY SESSION. Monday 7 June. Bob O. Evans. Japan, UK, USSR, Central Europe.

ART EXHIBIT. Systems Dimension, Ltd., ICCH/2 Touring Exhibition, Henry Christiansen Collection, other works.

INTERACTIVE AND NETWORK DEMONSTRATION. Telenet nationwide packet-switching network--first U.S. carrier in the field. Several dozen terminals in the Coliseum. Econometric forecasting models; information retrieval; conferencing; editing; engineering design graphics. 12+ computer centers.



N I M H : TECHNICAL HELP FOR PROPOSERS  
MINORITY GROUP MENTAL HEALTH PROGRAMS

Behavioral, social sciences and related mental health fields.

Telephone calls, letters, and site visits.

Prior to submission.

Send draft of ideas, objectives, budget to

Richard Lopez

Center for Minority Group Mental Health Programs

National Institute of Mental Health, Room 7-103

5600 Fishers Lane

Rockville, Maryland 20852

Telephone: 301-443-3724

N S F      FOREIGN CURRENCY PROGRAM  
                 EGYPT, INDIA, PAKISTAN, ETC.

The U.S. Government holds currency in these countries that cannot be exported.

Joint programs in scientific and engineering research are sought.

Support is available for

International travel for project development  
and meetings

Visits by individual U.S. scientists to  
institutions in participating countries

C A T A S T R O P H E   T H E O R Y

RENE THOM

1976 ANNUAL MEETING

SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS

HYATT REGENCY CHICAGO

JUNE 16-18, 1976

Theme:        Computation, Energy, and Ecology

Address:     H. B. Hair

SIAM Headquarters

33 South 17th Street

Philadelphia, Pennsylvania 19103

215-564-2929

N A T O :   ADVANCED STUDY INSTITUTE  
              STRUCTURAL / PROCESS THEORIES OF  
              COMPLEX HUMAN BEHAVIOR

Cross-disciplinary theory and research in artificial intelligence, cognitive and developmental psychology, individual differences, measurement, and instructional design.

DIRECTOR:   Professor Joseph M. Scandura  
              Merge Research Institute  
              1249 Greentree Lane  
              Narberth, Pennsylvania 19072

DATES:       To be arranged

LOCATION:     Banff Center, Banff, Alberta (probable)

N A T O :   ADVANCED STUDY INSTITUTE  
              MAN-COMPUTER INTERACTION

Human aspects including hardware and software interface design,  
programming, interaction with different classes of user,  
training and modelling.

DIRECTOR:   Professor B. Shackel  
              Department of Human Sciences  
              University of Technology  
              Loughborough, Leicestershire, U.K.

DATES:       August 1976

LOCATION:     Greece or Italy

N A T O : ADVANCED STUDY INSTITUTE

COMPUTER-BASED SCIENCE INSTRUCTION

Alternate approaches and uses of computer-based instructional systems in University Science teaching: Games; models and simulation; computerized individualized aptitude evaluation and strategy development; interactive computer graphics; computer-managed instruction; multi-media instructional programs.

DIRECTOR: Professor A. Jones  
Universite Catholique de Louvain  
Celestijnenlaan 200-C  
B-3030 Heverlee, BELGIUM

DATES: 19-30 July 1976

LOCATION: Louvain-la-Neuve, BELGIUM

C. S. P I E R C E    B I C E N T E N N I A L    I N T E R N A T I O N A L

C O N G R E S S

AMSTERDAM - GRAND HOTEL KRASNAPOLSKY

16 - 20 JUNE 1976

PRESIDENT:

Max H. Fisch

SPONSORS:

Charles S. Peirce Society and Foundation

International Association for Semiotic Studies

International Union of History and  
Philosophy of Science

Semiotic Society of America

Institute for Studies in Pragmaticism,  
Texas Tech University

Peirce Edition Project, Indiana University--  
Purdue University at Indianapolis

Research Center for Language and Semiotic  
Studies, Indiana University

COMMITTEE:

Carolyn Eisele, Chairman

Douglas Greenlee

Charles S. Hardwick

Peter Hare

Kenneth Ketner, Secretary

Edward C. Moore

Vincent Potter

Nicholas Rescher

Gresham Riley

Thomas A. Sebeok

ADDRESS:

Kenneth Laine Ketner, Secretary

Institute for Studies in Pragmaticism

Texas Tech University

P. O. Box 4530

Lubbock, Texas 79409

806-742-1193, 2272

NEW JOURNAL

COGNITIVE SCIENCE

EDITORS: Eugene Charniak, Allan Collins, Roger C. Schank

PUBLISHER:

CONTENTS 1:1: PROBLEM SOLVING IN SEMANTICALLY RICH DOMAINS  
AN EXAMPLE FROM ENGINEERING THERMODYNAMICS  
R. Bhaskar and H. A. Simon, Carnegie-Mellon

HUMAN AND COMPUTATIONAL QUESTION-ANSWERING  
W. Lehnert, Yale University

DEFINITE DESCRIPTIONS & SEMANTIC MEMORY  
A. Ortony and R. Anderson, U. of Illinois

ARTIFICIAL INTELLIGENCE, LANGUAGE, AND THE  
STUDY OF KNOWLEDGE

I. Goldstein and S. Papert, MIT

EDITORIAL: WHY COGNITIVE SCIENCE

Allan Collins, Bolt Beranek and Newman

"The discipline might have been called applied  
epistemology or intelligence theory, but  
someone on high declared it would be cognitive  
science and so it shall."



N S F : REJECTED PROPOSALS :  
RECONSIDERATION PROCEDURE

A new, standardized three step procedure has been announced by NSF for reconsideration of proposals initially declined.

1. Program Director is to supply explanation on request
2. Investigator is to request reconsideration within 180 days after rejection of proposal
3. Deputy Director is to review proposals on request within 180 days of reconsideration as in Step 2.

Re-examine administrative judgments  
as to scientific merit; can call for  
additional peer review

No further review will be made following these three steps, but a new proposal can be submitted. "New" means "substantially revised"

C O N F E R E N C E   C H R O N I C L E

PAST AND FUTURE CONFERENCES NOTED FOR THE RECORD

MIT - AT&T CONVOCATION: SESSIONS ON NEW APPROACHES TO A REALISTIC MODEL OF LANGUAGE   George A. Miller and Morris Halle, convenors.   Bresnan, Fujimura, Forster, Kaplan, Wanner, Garrett, Blumstein, Zurif, Jackendoff, Carey; Maratsos.   3/9/76

I R I A : ANALYSIS OF WRITTEN AND SPOKEN LANGUAGE AND ITS APPLICATIONS   Morris Salkoff, director.   Kayser, Kittredge, Gross, Haton, Miclet.   Paris, 4/12-16/1976.

ASSOCIATION FOR EDUCATIONAL DATA SYSTEMS - 14TH INTERNATIONAL CONVENTION   Don Bitzer, Plato chief; Herb Grosch of Computer-world; contributed papers.   May 4-7, 1976, at Phoenix.

COMPUTER LAW ASSOCIATION - GROSCH AS LUNCHEON SPEAKER.  
San Francisco, April 22-23, 1976.

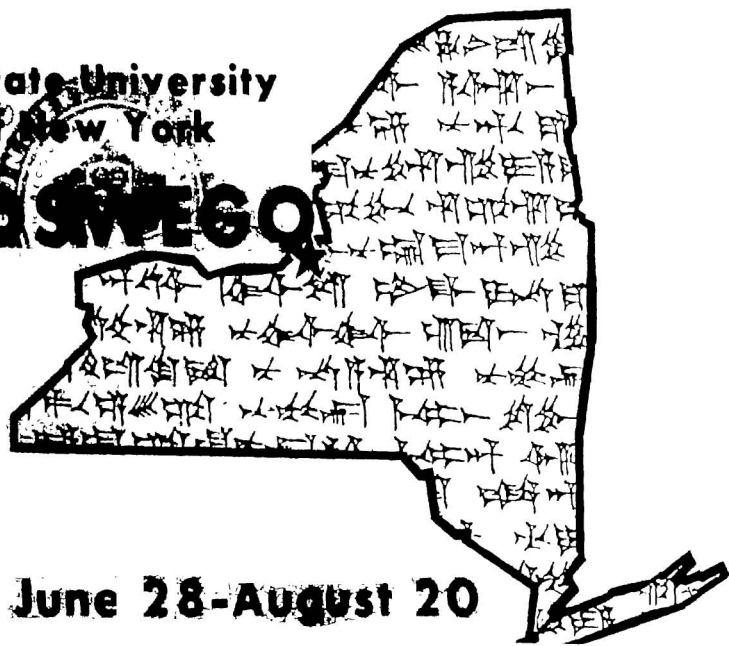
SECOND INTERNATIONAL CONFERENCE ON SOFTWARE ENGINEERING  
San Francisco, October 13-15, 1976.   IEEE Computer Soc & ACM

ACM SPRING SEMINAR   April 12-13, 1976, at Chicago.   Alex Orden  
U Chicago: Societal impact of computing.   Peter G. Lykos, IIT,  
Computers in education: Where are we and where are we going?

# The 1978 Linguistic Institute of the Linguistic Society of America

State University  
of New York

**OSWEGO**



**June 28-August 20**

# STATE UNIVERSITY OF NEW YORK

## 1976 LINGUISTIC INSTITUTE

Director, Carol F. Justus

Associate Director, Wmfred P. Lehmann

Assistant Director, Rand Bishop

SUNY Coordinator, Francine Frank

### SUNY Planning Committee for the Institute

Kenneth Abrams, SUNY-Buffalo  
 Frank Anshen, SUNY-Stony Brook  
 Harold Battersby, SUNY-Geneseo  
 Robert Cromack, SUNY-Cortland  
 Margaret Honour, SUNY-Oneonta  
 Paul Hopper, SUNY-Binghamton

Morgan Jones, SUNY-New Paltz  
 Dennis Preston, SUNY-Fredonia  
 Donald Reiff, University of Rochester  
 William Ritchie, Syracuse University  
 Linda Waugh, Cornell University

### FACULTY

MERVYN ALLEYNE	JOHN HELFELDT	DAVID ROOD
FRANK ANSHEN	REGINALD HENRY	ROGER SHUY
ALAN BELL	JOAN HOOPER	SUSAN STEELE
RAND BISHOP	PAUL HOPPER	STEPHEN STRAIGHT
MARINA BURT	CAROL JUSTUS	M. STUDDERT-KENNEDY
LYLE CAMPBELL	EDWARD KEENAN	DAVID TAYLOR
HEIDI DULAY	STEPHEN KRASHEN	SANDRA THOMPSON
CHARLES FERGUSON	SUSUMU KUNO	STANLEY WANAT
FRANCINE FRANK	WALLACE LAMBERT	LINDA WAUGH
VICTORIA FROMKIN	WINFRED LEHMANN	JOSEPI WIECHA
HOWARD GILES	CHARLES LI	MARIANNE WILLIAMS
TALMY GIVON	RICHARD LODER	WOLFGANG WOLCK
JOSEPH GREENBERG	DENNIS PRESTON	WALT WOLFRAM
PEG GRIFFIN	WILLIAM RITCHIE	LADISLAV ZGUSTA
SHIRLEY HEATH	WILGA RIVERS	

## LECTURES AND CONFERENCES

## LANGUAGE IN AMERICA

Weekly; sponsored by National Endowment for the Humanities

## DISTINGUISHED VISITING SCHOLARS

Five; sponsored by American Council of Learned Societies

## TYPOLOGY AND UNIVERSALS

Both weekly; conducted by Lehmann and Greenberg

SOCIETY FOR ELVISH STUDIES. JULY 10

Lise Menn, 45 Dexter Road, Newtonville, Mass 02160

STANFORD PHONOLOGY ARCHIVE WORKSHOP JULY 13-15

Charles Ferguson, Linguistics, Stanford U., Calif 04305

SECOND LANGUAGE ACQUISITION CONFERENCE JULY 17-18

William Ritchie, Languages, Syracuse U., New York 13210

HISPANIC AND LUSO-BRAZILIAN LINGUISTICS COLLOQUIUM JULY 24-25

Joan Hooper, Linguistics, SUNY Buffalo, New York 14261

INDO-EUROPEAN AND TYPOLOGICAL STUDIES JULY 28

Paul Hopper, Linguistics, SUNY Binghamton, New York 13901

AMERICAN DIALECT SOCIETY MEETING JULY 29

Hood Roberts, CAL, 1611 North Kent St., Arlington VA 22209

LSA SUMMER MEETING JULY 30-AUG 1

1611 North Kent Street, Arlington, Virginia 22209

TPOLOGY AND SYNTACTIC FIELD WORK CONFERENCE AUGUST 2-4

Stephen Anderson, Linguistics, UCLA, California 90024

AMERICAN INDIAN LINGUISTICS CONFERENCE AND FESTIVAL AUG 6-7

Lyle Campbell, Anthropology, SUNY Albany, New York 12222

# GENERAL INFORMATION

The 45th Summer Linguistic Institute of the Linguistic Society of America is being hosted by the State University of New York at its Oswego campus. The Institute has traditionally offered courses in particular aspects of linguistics which are not readily available to students and faculty on their home campuses.

The Institute focusing on two major themes, "Language Variation in America," in keeping with the bicentennial year, and "Language Universals and Typology," will include courses, lectures and seminars on these themes by internationally known scholars.

The Institute curriculum has been designed specifically to emphasize important current developments in the discipline, the mutual contributions of linguistics and related disciplines to one another, and the communication of these contributions to linguists and nonlinguists alike.

Courses will meet Monday, Tuesday, Thursday and Friday for one hour and 15 minutes unless otherwise specified. An additional 1 and 1/4 hours per week is to be arranged in consultation with the instructor. Please consult the Institute final brochure for course descriptions and prerequisites. Students who register for a course numbered 500 or above must be graduate students and prepared to do independent research in addition to following regular classroom work. Seniors may by petition to the Graduate Dean, be admitted to courses at the 500 level if they fulfill the prerequisites, and show that they are capable of work at the graduate level.

## COURSE OFFERINGS

Courses include undergraduate and graduate offerings. In order to most effectively offer courses for linguists, and for teachers and scholars outside the field of linguistics, the Institute will offer 2-week, 4-week, 6-week and 8-week courses.

The division of the 8-week period into units of 2 weeks and 6 weeks is designed to give linguists and nonlinguists an opportunity to obtain a structured sequence of courses outside their particular area of specialization. A 2-week intensive introductory course will be followed by 6-week courses in areas of interest to both linguists and nonlinguists. At the same time that students from other fields pursue the 2-week Intensive Introduction to Linguistics, linguists can also take advantage of courses in interdisciplinary topics. Basic and advanced linguistics courses will be offered as 4-week and 8-week courses. Courses listing only language requirements or introductory courses as prerequisites, and those without prerequisites, will be open to advanced undergraduate as well as to graduate students.

	J	U N E	2 8
July 9			
July 12			
		July 23	
		July 26	
	A U G	U S T	2 0

Full-time student participants will register for 8 or 9 credits. Some typical combinations might include:

- (1) two 8-week courses
- (2) one 2-week intensive and two 6-week courses
- (3) one 2-week intensive course, one 6-week and one 8-week course
- (4) one 4-week intensive course, one 4-week course, and one 6-week course

No one may, however, register for more than one intensive course nor obtain more than 9 semester hours of credit. Language arts teachers and professional people in other fields are encouraged to take advantage of the 2-week plus 6-week structured sequence. Linguists are also encouraged to explore related fields while pursuing more specialized interests in linguistics.

B A A L S E M I N A R O N  
T R A N S L A T I O N

EXETER, 13-14 SEPTEMBER 1976

DIRECTORS: R. R. K. HARTMANN AND W. S. DODD

SPEAKERS: K.-R. BAUSCH, BOCHUM  
P. NEWMARK (CENTRAL LONDON POLYTECHNIC)  
K. REISS (WURZBURG)  
C. SMITH (CAMBRIDGE)

AREAS: Linguistics-semantics and translation  
Training and craft of translator-interpreter  
Problems, procedures, aids to translation  
Translation in language teaching

REGISTRATION: Limited to 50 persons. Preference to members  
of British Association for Applied Linguistics

ADDRESS: The Language Centre  
University of Exeter  
Queen's Building  
The Queen's Drive  
Exeter EX4 4QH

INTERNATIONAL SEMINAR

I N D E X I N G   I N   P E R S P E C T I V E

WARSAW, POLAND

21 - 25 JUNE 1976

SPONSOR:   U N E S C O

ORGANIZER: National Federation of Abstracting & Indexing Services

PURPOSE:   Training of working indexers from developing countries  
            who wish to develop sophisticated information systems

PROGRAM:   History of indexing; systems and formats  
            effects on the retrieval process

LECTURERS: Everett H. Brenner, American Petroleum Institute  
            Stella M. Keenan, U. of Technology, Loughborough  
            Tefko Saracevic, Case Western Reserve University

WORKSHOPS: Toni Carbo Bearman, NFAIS  
            Gilbert R. Cintra, American Petroleum Institute

ADDRESS:   NFAIS  
            3401 Market Street  
            Philadelphia, Pennsylvania 19104  
  
            215-349-8495



OFFICERS: NATIONAL FEDERATION OF  
ABSTRACTING & INDEXING  
SERVICES - 1976 - 1977

PRESIDENT: John E. Creps, Jr., Engineering Index, Inc.

PRESIDENT-ELECT: Russell J. Rowlett, Jr., Chemica Abstracts

DIRECTORS: H. E. Kennedy, BIOSIS  
Ben-Ami Lipetz, Documentation Abstracts, Inc.  
Henry M. Koehler, American Dental Association  
Robert H. Marks, American Institute of Physics

SECRETARY: H. David Chafe, American Society for Metals

TREASURER: Henry M. Koehler, American Dental Association

RUSSELL J. ROWLETT, JR. is Editor of Chemical Abstracts Service. He was chairman of the Gordon Research Conference in 1974 and has been a member of the Committee on Chemical Information of the National Research Council for seven years. Before joining CAS in 1967, he was assistant director of the Virginia Institute for Scientific Research, and earlier director of research and development, Virginia-Carolina Chemical Corporation.

## EXPERIMENTS WITH A POWERFUL PARSER

MARTIN KAY

Xerox Palo Alto Research Center  
3180 Porter Drive  
Palo Alto, California 94304

### SUMMARY

The IBM 7040/44 computer program described in this Memorandum is capable of applying a grammar consisting of unusually powerful rules to sentences in a natural language so as to discover their underlying structures. All solutions allowed by the grammar are found. The Memorandum discusses the notation used to write rules and the extent to which they can be made to state the same linguistic facts as a transformational grammar.

### NOTE

This research was supported by the United States Air Force under Project RAND--Contract No. F44620-67-C-0045--monitored by the Directorate of Operational Requirements and Development Plans, Deputy Chief of Staff, Research and Development, Hq USAF. Views or conclusions contained in this Memorandum should not be interpreted as representing the official opinion or policy of the United States Air Force.

Originally published by The RAND Corporation, Santa Monica, California, as Memorandum RM-5452-PR, October 1967. Also published in the Proceedings of the International Conference on Computational Linguistics, Grenoble, 1967.

PREFACE

Any but the most rudimentary tasks in automatic language processing necessarily involve a procedure which makes the grammatical structure of sentences explicit and discovers grammatical ambiguities. Most existing programs are capable of applying context-free phrase-structure grammars to the sentences and the various techniques for doing this are, by now, fairly well understood. However, this kind of grammar is now generally considered to be inadequate because it fails to reveal the most important properties of the majority of sentences and because it typically declares a sentence to be more ambiguous than it really is. These difficulties are overcome to some extent by context-sensitive grammars and to a large extent by transformational grammars. The program discussed in this Memorandum is capable of analyzing sentences with context-sensitive grammars and with grammars of a class very similar to that of transformational grammars. Experimentation with this program is still in its very early stages, but the results reported here suggest that the technique used may prove to be a powerful and efficient tool for language analysis. If so, it can hope to find application in informational retrieval, command and control, intelligence analysis and many other areas.

---

AJCL will reprint from time to time contributions recognized to have signal importance in the history of computational linguistics and continuing value to students and practitioners. AJCL acknowledges with gratitude the approval of the copyright holders--Martin Kay, The RAND Corporation, and Bernard Vauquois --and the extraordinary help rendered by RAND in obtaining a photographable copy of this text.--Editor.

## TABLE OF CONTENTS

(Introduction)	25
1. The form of rules	27
2. Phrase-structure grammar	36
3. Transformational grammar	39
Conclusions	50

## EXPERIMENTS WITH A POWERFUL PARSER

This paper describes a sophisticated syntactic-analysis program for the IBM 7040/44 computer and discusses some of the problems which it brings to light. Basically the program is a nondeterministic device which applies unrestricted rewriting rules to a family of symbol strings and delivers as output all the strings that can be derived from members of the initial family by means of the rules provided. A subsidiary mechanism deals with the relation of dominance in the sense common in linguistics. This makes it possible for rules to refer to complete or partial syntactic structures, or P-markers, so that the program can be used, at least to some extent, for transformational analysis.

A program of this kind, which is intended for analyzing natural languages, must be capable of operating on a family of strings as a single unit because of the grammatical ambiguity of words. Take, for example, the famous sentence "Time flies like an arrow." These five words are not, themselves, the primary data on which a parsing program can be expected to operate. Instead, each word is replaced by one or more symbols representing the grammatical categories to which it belongs. The assignments for this example might be somewhat as follows:

<u>Word</u>	<u>Grammatical category</u>
Time	Noun, verb, adjective
flies	Plural noun, 3rd person verb
like	Singular noun, preposition, verb
an	Indefinite article
arrow	Singular noun, adjective.

Taking one category symbol for each word, it is possible to form 36 different strings, preserving the order of the original sentence. These 36 strings constitute the family on which the program would operate if set to analyze this sentence.

The program is said to perform as a non-deterministic device because, whenever two mutually incompatible rules are applicable to the same string, neither is given any priority; both are applied, and the resulting strings developed independently. Given the string "A B C" and the rules

$$A B \rightarrow X Y$$

$$B C \rightarrow Z$$

the program will therefore produce two new strings:

$$X Y C$$

$$A Z$$

The program contains no mechanism for guarding against sequences of rules which do not terminate. If the grammar contains the following rules

$$A B \rightarrow B A$$

$$B A \rightarrow A B$$

and the string to be parsed contains either "A B" or "B A", then the program will continue substituting these sub-strings for one another until the space available for intermediate results is exhausted. This may not seem to present any particularly severe problem because a pair

of rules such as these would never appear in any properly constructed grammar. But, as we shall shortly see, entirely plausible grammars can be constructed for which this problem does arise.

## 1. THE FORM OF RULES

In order to get a general idea of the capabilities of the program, it will be useful first to consider the notation used for presenting rules to it and the way this is interpreted by the machine. In what follows, we shall assume that the reader is familiar with the terminology and usual conventions of phrase-structure and transformational grammar. An example of the simplest kind of rewrite rule is

$$\text{VPRSG} = \text{PRES SG VERB}$$

The "equals" sign is used in place of the more familiar arrow to separate the left and right-hand sides of the rule. The symbols on which the rules operate are words consisting of between one and six alphabetic characters. The above rule will replace the symbol "VPRSG" by a string of three symbols "PRES SG VERB" whenever it occurs. The following rule will invert the order of the symbols "VERB" and "ING"

$$\text{VERB ING} = \text{ING VERB}$$

The simplest way to represent a context free phrase structure rule is as in the following example:

$$\text{NP AUX VP} = \text{S}$$

Notice that the normal order of the left and right-hand sides of the rule is reversed because the recognition process consists in rewriting strings as single symbols; the rules must therefore take the form of reductions rather than productions.

The program will accept phrase structure rules in the form we have shown, but, in applying them, it will not keep a record of the total sentence structure to which they contribute. In other words, it will cause a new string to be constructed, but will not relate this string in any way to the string which was rewritten. One way to cause this relationship to be preserved is to write the rule in the following form:

$$NP.1 \text{ AUX}.2 \text{ VP}.3 = S(1 \ 2 \ 3)$$

The numbers following the symbols on the left-hand side of the rule function very much like the numbers frequently associated with structural indices in transformational rules. When the left-hand side of the rule is found to match a particular sub-string, the number associated with a given symbol in the rule becomes a pointer to, or a temporary name for, that symbol. With this interpretation, the left-hand side of the above rule can be read somewhat as follows "Find an NP and call it 1; find an AUX following this and call it 2; find a VP following this and call it 3."

The numbers in parentheses after a symbol on the right-hand side of a rule are pointers to items identified by the left-hand side, and which the new symbol must dominate. In the example, the symbol "S" is to dominate all the symbols mentioned on the left-hand side.



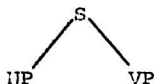
A pointer may refer to a single symbol, as we have shown, or to a string of symbols. The following rule is equivalent to the one just described:

$$\text{NP.1 AUX.1 VP.1} = \text{S(1)}$$

Furthermore, the string to which a pointer refers need not be continuous. Consider the following example

$$\text{NP.1 AUX VP.1} = \text{S(1)}$$

This will cause any string "NP AUX VP" to be rewritten as "S," but the "S" will dominate only "NP" and "VP." There will be no evidence of the intervening "AUX" in the final P-marker which will contain the following phrase:

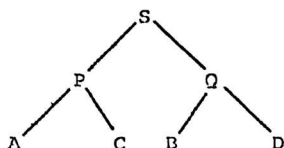


Consider now the following pair of rules:

$$\text{A.1 B.2 C.1 D.2} = \text{P(1) Q(2)}$$

$$\text{P.1 Q.1} = \text{S(1)}$$

If these rules are applied to the string "A B C D" the following P-marker will be formed:



Notice that the first rule in the pair not only re-orders the symbols in the P-marker but forms two phrases simultaneously.

A different way of using pointer numbers on the right-hand side can be illustrated by comparing the effects of the following two rules:

N.1 SG.1 V.2 SG.3 = NOUN(1) V(2) SG(3)

N.1 SG.1 V.2 SG.2 = NOUN(1) 2

What is required, we assume, is a context sensitive phrase-structure rule which will rewrite "N SG" as "NOUN" in the environment before "V SG". The first rule achieves this effect but also introduces a new "V" dominating the old one, and a new "SG". The second rule does what is really wanted: It constructs a phrase labeled "NOUN" as required, and leaves the symbols referred to by pointer number 2 unchanged.

The context-sensitive rule just considered is presumably intended to insure that singular verbs have only singular subjects. A second rule in which "SG" is replaced by "PL" would be required for plural verbs. But, since agreements of this kind may well have to be specified in other parts of the grammar, the situation might better be described by the following three rules:

SG.1 = NUM(1)

PL.1 = NUM(1)

N.1 NUM.2 V.3 2 = NOUN(1 2) 3 2

The first two rules introduce a node labeled "NUM" into the structure above the singular and plural morphemes. The third rule checks for agreement and forms the subject noun phrase. Pointer number 2 is associated with the symbol "NUM" in the second place on the left-hand side, and occurs by itself in the fourth place. This means that the fourth symbol matched by the rule must be "NUM", and also that it must dominate exactly the same sub-tree as the second. In the example we are assuming that "NUM" governs a single node which will be labeled either "SG" or "PL" and the rule will ensure that whichever of these is dominated by the first occurrence of "NUM" will also be dominated by the second occurrence. Notice that noun and verb phrases could be formed simultaneously by the following rule:

N.1 NUM.2 V.3 2 = NOUN(1 2) VERB(3 2)

The symbols "ANY" and "NULL" are treated in a special way by this program and should not occur in strings to be analyzed. The use of the symbol "NULL" is illustrated in the rule:

PPH = NULL

This will cause the symbol "PPH" to be deleted from any string in which occurs. The program is nondeterministic in its treatment of rules of this kind, as elsewhere, so

that it will consider analyses in which the symbol is deleted, as well as any which can be made by retaining it. The symbol "NULL" is used only on the right-hand sides of rules.

The symbol "ANY" is used only on the left-hand sides of rules and has the property that the word implies, namely that it will match any symbol in a string. The use of this special symbol is illustrated in the following rule:

VERB.1 ANY.1 NP.1 = VP(1)

This will form a verb phrase from a verb and a noun phrase, with one intervening word or phrase, whose grammatical category is irrelevant.

Elements on the left-hand sides of rules can be specified as optional by writing a dollar sign to the left or right of the symbol as in the following rules:

DET.1 ADJ\$.1 NOUN.1 = NP(1)

VERB.1 \$ANY.1 NP.1 = VP(1)

The first of these forms a noun phrase from a determiner and a noun, with or without an intervening adjective. The second is a new version of a rule already considered. A verb phrase is formed from a verb and a noun phrase, with or without an intervening word or phrase of some other type.

Elements can also be specified as repeatable by writing an asterisk against the symbol, as in the following example:

VERB.1 \*NP.1 = VP(1)

This says that a verb phrase may consist of a verb followed by one or more noun phrases. It is often convenient to be able to specify that a given element may occur zero or more times. This is done in the obvious way by combining the dollar sign and the asterisk as in the following rule:

$$\text{\$DFT.1 *\$ADJ.1 N.1 *PP\$ .1 = NP(1)}$$

According to this, a noun may constitute a noun phrase by itself. However the noun may be preceded by a determiner and any number of adjectives, and followed by a prepositional phrase, and all of these will be embraced by the new noun phrase that is formed. Notice that the asterisk and the dollar sign can be placed before or after the symbol they refer to. The combination is often useful with symbol "ANY" in rules of the following kind

$$\text{N.1 NUM.2 *\$ANY.3 V.4 2 = NOUN(1 2) 3 VERB(4 2)}$$

This is similar to an earlier example. It combines the number morpheme with a subject noun and with a verb, provided that the two agree, and allows for any number of other symbols to intervene. The symbol "ANY" with an asterisk and a dollar sign corresponds in this system to the so called variables in the familiar notation of transformational grammar.

Consider now the following rule:

$$\text{SCONJ.1 NP(S).1 = NP(1)}$$

This will form a noun phrase from a subordinating conjunction followed by a noun phrase, provided that this dominates only the symbol "S". Any symbol on the left-hand side of the rule may be followed by an expression in parentheses specifying the string of characters that

this symbol must directly dominate. This expression is constructed exactly like the left-hand sides of rules. In particular, it may contain symbols followed by expressions in parentheses. The following rule will serve as an illustration of this, and of another new feature:

NP(\$DET.1 \$\*ANY.1 ADJ(PPRT.2) \$\*ANY.3 N.4

\$ PP.5) = 1 3 4 WH DEF 4 BE ADJ((2)) 5

This rule calls for a noun phrase consisting of a noun, a preceding adjective which dominates a present participle and, optionally, a number of other elements. This noun phrase is replaced by the determiner from the original noun phrase, if there is one, the elements preceding the noun except for the present participle, the noun itself, the symbol "WH", the symbol "DEF", another copy of the noun, the symbol "BE", the symbol "ADJ" dominating exactly those elements originally dominated by "PPRT" and, finally, any following prepositional phrases the original noun phrase may have contained. The number "2" in double parentheses following "ADJ" on the right-hand side of this rule specifies that this symbol is to dominate, not the present participle itself, but the elements, if any, that it dominates. This device turns out to have wide utility.

Double parentheses can also be used following a symbol on the left-hand side of a rule, but with a different interpretation. We have seen how single parentheses are used to specify the string immediately dominated by a given symbol. Double parentheses enclose a string which must be a proper analysis of the sub-tree dominated by the given symbol. A string is said to be a proper analysis of a sub-tree if each terminal symbol of the sub-tree is dominated by some member of the string. As usual, a

symbol is taken to dominate itself. As an example of this, consider the following rule:

ART.1 S((ART N.2 ANY\*)).1 2 = DET(1) 2

This rule applies to a string consisting of an article, a sentence, and a noun. The sentence must be analysable, at some level, as an article followed by a noun, followed by at least one other word or phrase. The noun in the embedded sentence, and the sub-tree it dominates, must be exactly matched by the noun corresponding to the last element on the left-hand side of the rule. The initial article and the embedded sentence will be collected as a phrase under the symbol "DET" and the final noun will be left unchanged.

The principal facilities available for writing rules have now been exemplified. Another kind of rule is also available which has a left-hand side like those already described but no "equals" sign and no right-hand side. However it will be in the best interests of clarity to defer an explanation of how these rules are interpreted.

The user of the program may write rules in exactly the form we have described or may add information to control the order in which the rules are applied. This additional information takes the form of an expression written before the rule and separated from it by a comma. This expression, in its turn, takes one of the following forms:

$n_1,$ 
 $n_1/n_2,$ 
 $n_1/n_2/n_3,$ 
 $n_1//n_3,$ 

$n_1$  is an integer which orders this rule relative to the others. Since the same integer can be assigned to more than one rule, the ordering is partial. Rules to which no number is explicitly assigned are given the number 0 by the program.  $n_2$  and  $n_3$ , when present, are interpreted as follows: Every symbol in the sub-string matched by the left-hand side of the rule must have been produced by a rule with number  $i$ , where  $n_2 \geq i \geq n_3$ . For these purposes the symbols in the original family of strings offered for analysis are treated as though they had been produced by a rule with number 0.

## 2. PHRASE-STRUCTURE GRAMMAR

It will be clear from what has been said already that this program is an exceedingly powerful device capable of operating on strings and trees in a wide variety of ways. It would clearly be entirely adequate for analyzing sentences with a context-free phrase-structure grammar. But this problem has been solved before, and much more simply. We have seen how the notation can be used to write context-sensitive rules, and we should therefore expect the program to be able to analyze sentences with a context-sensitive grammar. However in the design of parsing algorithms, as elsewhere, context-sensitive grammars turn out to be surprisingly more complicated



than context-free grammars.

The problem that context-sensitive grammars pose for this program can be shown with a simple example.<sup>1</sup>

Consider the following in grammar:

- |   |         |     |
|---|---------|-----|
|   | A B C   | (1) |
| S | D E (S) | (2) |
|   | D/A__   | (3) |
| B | F/___E  | (4) |
|   | G/A__   | (5) |
| D | B/___E  | (6) |

This grammar, though trivial, is well behaved in all important ways. The language generated, though regular and unambiguous, is infinite.

Furthermore, every rule is useful for some derivation. Since the language generated is unambiguous, the grammar is necessarily cycle-free, in other words, it produces no derivation in which the same line occurs more than once. Suppose, however, that the grammar is used for analysis and is presented with the string "A D E" -- not a sentence of the language. The attempt to analyze this string using rules of the grammar results in a rewriting operation that begins as follows and continues indefinitely:

---

<sup>1</sup>I am indebted for this example, as for other ideas too numerous to document individually, to Susumu Kuno of Harvard University.

A D E

A B E (by rule 3)

A D E (by rule 6)

A B E (by rule 3)

etc.

It would clearly be possible, in principal, to equip the program with a procedure for detecting cycles of this sort, but the time required by such a procedure, and the complexity that it would introduce into the program as a whole, are sufficient to rule it out of all practical consideration. It might be argued that the strings which have to be analyzed in practical situations come from real texts and can be assumed to be sentences. The problem of distinguishing sentences from nonsentences is of academic interest. But, in natural languages, the assignment of words to grammatical categories is, as we have already remarked, notoriously ambiguous and for this problem to arise it is enough for suitably ambiguous words to come together in the sentence. A sentence which would be accepted by the above grammar, but which would also give rise to cycles in the analysis, might consist of words with the following grammatical categories:

<u>Word</u>	<u>Grammatical Category</u>
1	A
2	B
3	C, F

The program, as it stands, contains no mechanism which automatically guards against cycles. However, if the user knows where they are likely to occur or discovers them as a result of his experience with the program, he can include some special rules in his grammar which will prevent them from occurring. These rules, which we have already eluded to, are formally similar to all others except that they contain no "equals" sign and no right-hand side. When a P-marker is found to contain a string which matches the left-hand side of one of these rules, the program arranges that, thence forward, no other rule shall be allowed to apply to the whole string. The cycle in this latest example could not occur if the grammar contained the rule:

A B E

### 3. TRANSFORMATIONAL GRAMMAR

We now come to the main concern of this paper which is to discuss the extent to which the program we have been describing can be made to function as a transformational analyzer. The main purpose of the examples that have been given is to show the great power of the program as a processor of symbol strings. The notion of dominance is provided for, but only in a

rudimentary way. It certainly could not be claimed that the program is a tree processor in any really workable sense. But grammatical transformations are operations on trees and our investigation therefore must take the form of showing that these operations can frequently, if not always, be mimicked by string rewriting rules.

We shall take it that a transformational grammar consists of a context-free or context-sensitive phrase-structure component and a set of transformations ordered in some way. To begin with, very little will be lost if we assume that the transformational rules are simply ordered.

Consider now the first transformation in the list. In general, this may be expected to introduce phrases into the P-markers to which it applies which could not have been generated by the phrase-structure component. Let us now write some additional phrase-structure rules capable of generating these new phrases. Let us insert these rules into the grammar immediately following the first transformational rule and establish the convention that, when they are used in the analysis of the string, their output will be used only as input to the first transformation. Now treat the second transformational rule in the same way. It also can be expected to create new kinds of phrase and phrase-structure rules can be written which would recognize these. It may be that some of the phrases formed by the second rule could also be formed by the first, and in this case, it may be possible to move the appropriate rule from its position after the first transformation to a position after the second and to mark it as providing input only for these two rules.

Notice that the rules we are proposing to construct will not constitute what has sometimes been called a surface grammar. The phrases they describe certainly do

not belong to the base structure and many of them may not be capable of surviving unchanged into the surface structure. In general these rules describe phrases which can only have transitory existence somewhere in the generative process. Notice also that in order to describe these phrases adequately it may sometimes be necessary to extend the notion of phrase structure grammar somewhat. Consider for example the following transformation:

$$\begin{array}{cccc} X & - & A & - & B & - & Y \\ & & 1 & & 2 & & 3 & & 4 \end{array}$$

Adjoin 2 as right daughter of 3

If we make the usual assumption that a rule is applied repeatedly until no proper analyses of the P-marker remain which can be matched by its structural index, then this transformation, and many others, may produce phrases of indefinitely many types. Let us suppose that, before this transformation is applied for the first time, all possible phrases that can be dominated by the symbol "B" are describable by context free phrase structure rules of the following form:

$$B \longrightarrow \left\{ \begin{array}{c} \alpha_1 \\ \alpha_2 \\ \dots \\ \alpha_k \end{array} \right\}$$

Where the  $\alpha_i$  are any strings. The phrase structure grammar needed to describe all the phrases that can exist after the operation of this transformation must contain the following rules, or more accurately rule schemata

$$B \longrightarrow \left\{ \begin{array}{c} \alpha_1 \\ \alpha_2 \\ \dots \\ \alpha_k \end{array} \right\} A^*$$

where the asterisk indicates one or more repetitions of the symbol "A". If the left and right-hand sides of these rules are reversed and they are presented to the program in the proper notation, then the transformation itself can be represented by the following pair of rules:

$$B(*\$ANY.1 *A.2) = 2 B+ 1 +B$$

$$B+ B.1 +B = 1$$

Since there are no facilities for specifying dominance relations among elements on the right-hand sides of these rules, it is necessary to resort to subterfuge. The phrase dominated by the symbol "B" is reproduced in the output of this rule with copies of the symbol "A" removed from the right-hand end and the remainder bounded by the symbols "B+" and "+B". These symbols serve to delimit a part of the string which can only figure in the complete analysis of the sentence if it constitutes a phrase of

type "B". The second rule removes these boundary symbols from the phrase of type "B" and, since no pointer is assigned to them, they will leave no trace in the final P-marker.

Another, and perhaps more economical, way to write recognition rules corresponding to this transformation involves conflating the additional phrase-structure rules with the reverse of the transformational rule itself to give rules of the following kind:

$$\alpha_{i.1} * A.2 = 2 B+ 1 +B \quad (1 \leq i \leq n)$$

$$B+ B.1 +B = 1$$

In fact, the elementary transformation for daughter adjunction that we are providing for here is more general than that often allowed by transformational grammarians. It is common to require that if some element a is adjoined as a daughter of another element b then b must have no daughters before the transformation takes place.

Sister adjunction can be treated in an analogous manner. Consider the following transformation:

$$\begin{array}{cccc} X & - & A & - & B & - & Y \\ & & 1 & & 2 & + & 3 & & 4 \end{array}$$

Adjoin 2 as right sister of 4.

The phrases existing before this transformation is carried out, and which have "B" as a constituent, can be thought of as being described by a set of rules as follows:

$$a_1 \longrightarrow B \alpha_1$$

$$a_2 \longrightarrow B \alpha_2$$

. . .

$$a_n \longrightarrow B \alpha_n$$

Here the  $a_i$  are nonterminal symbols and the  $\alpha_i$  are strings, possibly null. The grammar which describes the phrases existing after the operation of this transformation must contain, in addition, the following rules:

$$a_1 \longrightarrow B \alpha_1 A^*$$

$$a_2 \longrightarrow B \alpha_2 A^*$$

. . .

$$a_n \longrightarrow B \alpha_n A^*$$

The reverse transformation itself can now be represented by a set of rules as follows:

$$B.1 \alpha_i.1 A^*.2 = 2 B + 1 + B$$

Notice that the strings referred to by the symbols "x" and "y" in both of the above transformations are unchanged by the transformation and are therefore not mentioned at all in the analysis rules. Experience shows that it is in fact rarely necessary to write a separate rule for each  $\alpha_i$ . In most cases, a transformation of this kind



could be handled in the program with a rule of the following form:

$$B.1 \text{ ANY.1 } A*.2 = 2 \text{ B} + 1 + B$$

This is one of a large number of cases in which it has been found that the analysis rules can be made more permissive than the original grammar suggests without introducing spurious structures and without seriously increasing the amount of time or space used by the program.

While it is possible that transformational analysis can be done in an interesting way with a program of this sort, there seems to be little hope of finding an algorithm for writing analysis rules corresponding to a given transformational grammar. The following rule also involves sister adjunction but poses much more serious problems than the previous example:

$$\begin{array}{cccccc} X & - & A & - & Y & - & B & - & Z \\ 1 & & 2 & & 3 & & 4 & & 5 \end{array}$$

Adjoin 2 as right sister of 4

The problem here is that a variable "Y" intervenes between "A" and "B". On the face of it, the analysis rule corresponding to this transformation would have to be somewhat as follows:

$$*\$ANY.1 \text{ B.2 } *A.3 = 3 \text{ 1 } 2$$

And in principal the program could carry out a rule of this kind. However the first symbol on the left-hand side of this rule will match any string whatsoever, so

that, if the rule can be applied at all, it can be applied in a prodigious number of ways. But, with real grammars, it usually turns out that quite a lot can be said about the part of the sentence covered by the variable "Y" so that analysis rules can be written which are sufficiently specific to be practicable.

Deletions are notoriously troublesome in grammars of any kind because they can so easily give rise to cycles and undecidable problems. Transformational grammarians require that lexical items should only be deleted from a P-marker if there is some other copy of the same item which remains. This condition insures what they call the recoverability of the transformation. However, it is very important to realize that recoverability, in this sense, is a very weak condition. The requirement is that, knowing that an item has been deleted from a certain position in the P-marker, it should be possible to tell what that item was. But there is no requirement that a P-marker should contain evidence that it was derived by means of a deletion transformation or of the places in it where deletions might have taken place.

Deletions are more easy to cope with in certain situations than others. Consider for example the following transformation:

X	-	A	-	B	-	A	-	Y
1		2		3		4		5

Delete 4.

The recoverability requirement is satisfied because of the identity of the second and fourth elements in the structural index. The corresponding rule for the program

might be as follows:

$$23/22, A.1.B.2 = 1\ 2\ 1$$

It is necessary to provide ordering information with a rule of this kind because it would otherwise be capable of operating on its own output and cycling indefinitely. But presumably this transformation can be carried out any number of times and the same therefore should be true of the corresponding analysis rule. Once again, experience shows that the grammarian almost invariably knows more about the environment in which a deletion takes place than is stated in the rule, and if this information is used carefully, analysis rules can be written which do not lead to cycles.

In principle the situation is even worse in rules of the following kind:

X - A - Y - A - Z

1      2      3      4      5

Delete 4

Here the third element is a variable which can cover any number of nodes in the P marker. In analysis we are therefore not only without information about how many times the rule may have been applied but we know nothing about where to insert new copies of the symbol "A", except that they must be to the right of the existing copy.

The other commonly used elementary transformations (substitutions and Chomsky-adjunction) do not present special problems. The main outstanding difficulty comes from the fact that transformational rules are ordered.

We have already said that the theory of transformational grammar is in a state of continual change and this is particularly true of the part that concerns the ordering of rules. For this reason we have assumed that the rules are simply ordered in the hope that other possibilities will not be notably more difficult to deal with. We shall also make the assumption that transformational rules are all obligatory.

Consider now the following grammar

Phrase structure

$$1. S \rightarrow A (D) B C$$

$$2. C \rightarrow D E$$

Transformations

$$1. A - B - X$$

$$1 \quad 2 \quad 3$$

$$0 \quad 2+1 \quad 3$$

$$2. X - B - D - Y$$

$$1 \quad 2 \quad 3 \quad 4$$

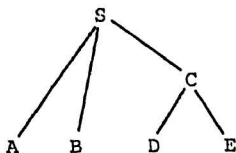
$$1 \quad 3+2 \quad 0 \quad 4$$

and suppose that the program is required to analyze the string "A D B E". Since, in generation, the list of transformations is read from top to bottom it is reasonable to suppose that in analysis it should be read from bottom

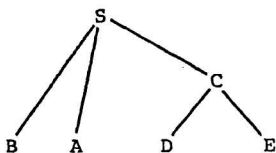
to top. We may take it that the analysis rule corresponding to the second transformation is somewhat as follows:

$$D.1 \ B.2 = 2 \ 1$$

This, together with the two phrase-structure rules, is sufficient to give a complete analysis of the string with this underlying P-marker:



But if this is an underlying P-marker, the second transformational rule could not possibly be used to produce a derived structure from it because the first transformation, which according to our assumption is obligatory, can be applied to it giving the following result:



It is in fact not sufficient to scan the list of transformations from bottom to top because this procedure does not make allowance for the fact that the transformations are obligatory. To regard transformations as optional which were intended to be obligatory is in general to associate spurious base structures to some

sentences. The solution for the present grammar is to use the following set of analysis rules:

1/0, B D  
 2/1, D.1 B.2 = 2 1  
 3/2, A B  
 4/3, B.1 A.2 = 2 1  
     D.1 E.1 = C(1)  
     A.1 \$D.1 B.1 C.1 = S(1)

The first and third rules contain, in effect, the structural indices from the second and first transformations respectively. The first rule says that no string is acceptable as a sentence which contains "B D" as a sub-string because to this it would have been possible to apply transformation 2. The second rule reverses the effect of transformation 2. The third rule excludes any P-marker existing at this stage with a proper analysis containing "A B" as a sub-string. This is the structural index of transformation 1 which therefore should have been applied to any P-marker containing it. The fourth rule reverses the effect of transformation 1 and the remaining rules are the phrase-structure component of the grammar. Once again it turns out that what may be necessary in theory is only rarely needed in practice. Experience with this program is, so far, very limited but no cases have so far been found in which incorrect analyses have resulted from omitting rules such as those numbered one and three above.

#### CONCLUSIONS

It requires skill to write rules for analyzing natural sentences with the program described in this

paper. A program can only properly be called a transformational parser if it can work directly with the unedited rules of the transformational grammar. But no algorithm is known, nor is it likely that one will shortly be found, which will produce from a transformational grammar a set of corresponding rules of the kind required by this program. It is not difficult to construct a transformational grammar for which no exactly corresponding set of analysis rules can be written. However, other programs have been written which, though they are still in many ways imperfect, can more reasonably be called transformational parsers. What then are the advantages of the present program?

The current version of the program is written in ALGOL and with very little regard for efficiency. But the basic algorithm is inherently a very great deal more efficient than any of its competitors. The various interpretations of an ambiguous sentence, or a sentence which seems likely to be ambiguous in the early stages of analysis, are all worked on simultaneously. At no stage can the program be said to be developing one interpretation of a sentence rather than another. If two interpretations differ only in some small part of the P-marker, then only one complete P-marker is stored with two versions of the ambiguous part. Work done on the unambiguous portion is done only once for both interpretations.

The program, though undoubtedly very powerful, seems naive from the point of view of modern linguistic theory. The program embodies very little of what we know or believe to be true about the structure of natural languages. It might well be said that a computer program for analyzing natural languages is only interesting to the extent that it makes a claim about the basic form of those languages.

But the program described here is intended as a tool and not as a linguistic hypothesis. There is much to be learned about natural language from ruminating on the form of universal generative grammar and trading counter-example for example. But there is also much to be learned from studying text as it actually occurs. The small amount of work that has so far been done with this program has been sufficient to suggest strongly that a set of rules derived algorithmically from a transformational grammar is unlikely to be the most effective or the most revealing analytic device.



## afips Washington Report

\*\*\*\*\*

### AJCL EDITOR'S NOTE

In August, 1975, the Washington Office of AFIPS began publishing a Report. By the time the Report's existence came to be known to AJCL, and arrangements for reprinting were settled, the first volume of the Report had been completed and the second well begun.

We begin with the entire back file; henceforth the Report will appear regularly in AJCL, omitting only those items that AFIPS does not permit to be reprinted (for example, on account of restrictions imposed by third-party copyright owners).

The news from Washington may be good or bad, but is always important to those who live as close to the Federal Government as educators and researchers, not to mention engineers, must do.

--DGH

Vol. I, No. 1

August, 1975

## A MESSAGE FROM THE AFIPS PRESIDENT

The first issue of this Washington Report signifies the real beginning of AFIPS activity in Washington. Through this medium we shall communicate to the AFIPS constituent societies and the members of these societies about computer and information processing related activities of the Federal government and about the matters to which the staff of the Washington Office is devoting particular attention.

I am very pleased that the opening of the Washington Office of AFIPS coincides so closely with the start of my own term as President of AFIPS. The establishment of this Office has been a particular interest of mine for some time; during my term as President I expect to devote a considerable amount of time to it. In order for the Washington Office to be a success, a number of pieces will have to fit together. Two of them most appropriate for mention here are:

This Washington Report must develop into a useful, not to say indispensable publication to its recipients; this will happen most surely if we receive feedback from you on what you like and don't like, on what should be in the Report which is not and on what shouldn't be in the Report which is.

The Washington Report is being distributed to senior officials of the AFIPS constituent societies. From you we solicit ideas on what the Washington Office should be involved in. Your suggestions on how the information processing community can be best served by the AFIPS Washington Office are most important to us.

Anthony Ralston

## WASHINGTON DEVELOPMENTS

### DR. WILLIS H. WARE APPOINTED TO PRIVACY PROTECTION STUDY COMMISSION

It was announced on June 10 that Dr. Willis H. Ware of the Rand Corporation has been appointed as a member of the Privacy Protection Study Commission by the President of the United States. Dr. Ware will serve on the Commission as an independent, private citizen. He is currently Chairman of the AFIPS Special Committee on the Right of Privacy, and was the first president of the Federation. In 1973, he served as Chairman of the Secretary's Advisory Committee on Automated Personal Data Systems, in the Office of the Secretary of the Department of

Health, Education and Welfare; this committee produced the landmark report Records, Computers and the Rights of Citizens.

According to the Privacy Act of 1974, the Commission is to "(1) make a study of the data banks, automated data processing programs, and information systems of governmental, regional, and private organizations, in order to determine the standards and procedures in force for the protection of personal information; and (2) recommend to the President and the Congress the extent, if any, to which the requirements and principles of [the Act] should be applied to the information practices of those organizations by legislation, administrative action, or voluntary adoption of such requirements and principles, and report on such other legislative recommendations as it may determine to be necessary to protect the privacy of individuals while meeting the legitimate needs of government and society for information."

#### NEW EXECUTIVE DIRECTOR OF DOMESTIC COUNCIL COMMITTEE ON PRIVACY

Vice-President Rockefeller announced on June 26 the appointment of Quincy Rodgers as Executive Director of the Domestic Council Committee on the Right of Privacy. Mr. Rodgers is currently Minority Council to the Subcommittee on Separation of Powers of the Senate Judiciary Committee.

The Domestic Council Privacy Committee was established in 1974 as the arm of the Administration responsible for developing and coordinating agency views, policy recommendations, and specific legislative and administrative initiatives regarding the collection, storage, and dissemination of information about individual Americans.

#### EGER OUTLINES OTP AGENDA

John Eger, Acting Director of the Office of Telecommunications Policy, in the Executive Office of the President, outlined the agenda of his office in a May 28th speech before the Computer and Business Equipment Manufacturers Association. Addressing what the Office of Telecommunications Policy might do to insure a market minimally constrained by government regulation, Eger submitted the following:

"One, encourage an even greater role for competition and market forces in the communications industry . . . Two, address the privacy and privacy-related problems intensified by the sheer speed and efficiency of computer communications . . . And, three, . . . seek to maximize reliance on the private sector for the provision of information services . . ."

#### EFTS LEGISLATIVE PROPOSALS

Against the background of the broad EFTS moratorium proposed last January by Senator Proxmire in the Senate and Mr. St. Germain in the House of Representatives, two bills of lesser scope have recently been introduced. The earlier Proxmire moratorium would require that no financial institution enter into a contract involving electronic methods of fund transfers at places of business other than financial institutions and clearinghouses.

Senator McIntyre introduced on June 6 a bill which would restrict certain Federal financial institutions from engaging in transactions with its customers outside the state in which the Federal institution is located, unless the laws of that state specifically authorized such transfers. Mr. St. Germain introduced in the House on June 18 legislation which would impose a 90 day moratorium under which no Federal regulatory agency or financial institution could approve or authorize the establishment or expansion of any electronic funds transfer systems; during this period, the National Commission on Electronic Fund Transfers would submit a report to the Congress which would contain its recommendations regarding further legislation.

#### EFTS APPOINTMENTS REMAIN PENDING

Presidential appointments to the National Commission on Electronic Fund Transfers remain pending, although the Commission was created in October, 1974 by Act of Congress. Concern over the delay has been voiced by Senator McIntyre, Chairman of the Financial Institutions Subcommittee of the Senate Banking Committee, as well as by members of the private sector. The Commission is to recommend, after a thorough study and investigation, appropriate administrative and legislative action in connection with the possible development of public or private electronic fund transfer systems.

#### PUBLICATION GUIDELINES FOR THE PRIVACY ACT OF 1974

The Federal Register on June 19 published guidelines for Federal Agency compliance with the Privacy Act of 1974. The OFR guidelines state that "[a] Federal Agency may not use a system of records after September 27th unless it has published in the FEDERAL REGISTER a notice for that system that meets the requirements of . . . the Act." Accordingly, the OFR guidelines require in each notice: the system name; location at which records are maintained; categories of individuals on whom records are maintained; type of information contained in system records; routine use of the system; title and address of the agency official responsible for system; and a means by which an individual can gain access to and contest records.

#### FORD ADMINISTRATION INTRODUCES BILL FOR WHITE HOUSE SCIENCE ADVICE

Senator Moss, in behalf of the Ford Administration, introduced on June 20 a bill to establish a science advisory mechanism in the White House. While there are currently several bills pending before the Congress on this subject, the administration bill (S.1987) and a bill introduced in the House by Mr. Teague (H.R.4461) are considered to be the most likely contenders for enactment. S.1987 would establish in the Executive Office of the President an Office of Science and Technology Policy. The Director of the office would be the President's chief policy advisor with respect to scientific and technological matters.

## THEODORE PUCKORIOUS NAMED COMMISSIONER OF ADTS

The Administrator of the General Services Administration announced on May 19 that Theodore D. Puckorius has been named Commissioner of the Automated Data and Telecommunications Service (ADTS). ADTS is responsible for government-wide ADP resource management and procurement.

## AFIPS IN WASHINGTON

### AFIPS OPENS WASHINGTON OFFICE ON JUNE 26, 1975

The opening of the AFIPS Washington Office, approved by the AFIPS Board of Directors in November, 1974, took place formally on June 26, 1975.

Office Charter. The charter of the Washington Office, as established by the AFIPS Board, is:

- (1) to provide an information service to AFIPS constituent societies; and
- (2) to establish contact with Federal agencies and the Congress, and make experts and expertise available from the AFIPS constituency to such groups.

Washington Activities Committee. The Washington Office will operate under the AFIPS Washington Activities Committee, chaired by Mr. Keith Uncapher, Director of the University of Southern California Information Sciences Institute. Committee members are Dr. Frank Ryan, Director of Information Systems for the U. S. House of Representatives, and Mr. Ralph Leatherman of the Hughes Tool Company.

Special Inaugural Presentation. The Washington Office was formally inaugurated by a conference addressing the theme of "Information Processing as a National Resource." Speakers, representing the Federal government, academia and industry, included Senator John Culver (Iowa); Dr. Brockway McMillan, Vice President, Military Systems, Bell Telephone Laboratories; Dr. Ruth Davis, Director of the Institute for Computer Sciences and Technology, National Bureau of Standards; and Dr. Allen Newell, University Professor at Carnegie-Mellon University.

### MARCENE TERRONES JOINS AFIPS STAFF

Marcene E. Terrones has joined the AFIPS staff as secretary in the newly opened AFIPS Washington Office. She brings matching credentials to a job which demands a broad range of experience; most recently, she has served as Assistant Administrator in the International Union of Operating Engineers and Pipe Line Employers Health and Welfare Fund. We trust you will all come to know her as you come in contact with the Washington Office; congratulations in your new job, Marcie, and welcome aboard!



## PRIVACY COMMISSION ELECTS CHAIRMAN, APPOINTS EXECUTIVE DIRECTOR

The Privacy Protection Study Commission elected David F. Linowes as its chairman on July 11. Linowes subsequently announced on August 14 the appointment of Carole W. Parsons as executive director of the Commission. Mr. Linowes is an international management consultant and a certified public accountant. Ms. Parsons has formerly been associated with the White House Domestic Council Committee on the Right of Privacy and the HEW Advisory Committee on Automated Personal Data Systems.

In carrying out its statutory charter (Washington Report, 8/75), the Commission will emphasize the assessment of privacy safeguards in the business and industry sector. It will examine policy issues associated with the interstate transfer of information, the use of personal identifiers, and information activities in areas such as employment, insurance, credit, banking, health, and social service. It will publish a final report by June, 1977.

Chairman Linowes has indicated "the strong desire of the Commission to receive suggestions from the public on which facets of the private sector should be given major attention;" further, Ms. Parsons has stated that she will be looking for new ideas and lines of research to propose to the Commission. The AFIPS Washington Office will endeavor to play an active role in providing assistance and input to the Commission; comments from the AFIPS societies are therefore of substantial importance, and are strongly solicited.

## U. S. SUPREME COURT TO REVIEW NEW CASE ON PATENT OF SOFTWARE

There is now pending before the U. S. Supreme Court a review of the software patent granted to Thomas R. Johnston. The Court ruled in the 1972 Benson-Tabbot case that the software patent then in question was not valid, but the Justices did not resolve the issue of software patentability in general. Instead, the Court deferred to the Congress for a definition of the legal protections to be afforded to software; the Congress, however, has not responded. In the brief for the United States filed in the pending case; Solicitor General Robert Bork has asked the Court to resolve whether a computer program is patentable as a machine (rather than as a process), arguing that it is unreasonable to characterize a programmed general purpose computer as a "new machine".

## MAJOR FEDERAL AGENCIES PROPOSE REGULATIONS TO IMPLEMENT PRIVACY ACT OF 1974

Federal agencies are required by the Privacy Act of 1974 to publish, prior to August 28, 1975, proposed implementing regulations for public comment. Comments from the AFIPS societies may be submitted through the AFIPS Washington Office. Major agencies which have proposed rules subject to comment during September include:

<u>Agency</u>	<u>Deadline for Comments</u>	<u>Federal Register Citation for Text of Rules</u>
National Science Foundation	9/5/75	7/29/75 p. 31811
Securities Exchange Commission	9/12/75	8/15/75 p. 34417
Office of Management and Budget	9/12/75	8/14/75 p. 34165
Health, Education and Welfare	9/15/75	8/14/75 p. 34129

## GENERAL ACCOUNTING OFFICE REPORTS WASTE IN COMPUTER SYSTEM ACQUISITIONS UNDER FEDERAL GRANTS

The General Accounting Office has submitted a report to the Congress which finds that, due to the lack of appropriate Federal procedures, recipients of Federal grants for acquisition of data processing equipment have been allowed to utilize unsatisfactory procurement practices. The report stated that grantees: obtained new computer equipment without thoroughly evaluating their needs; obtained their own computer systems without adequately exploring opportunities for joint use of existing computer facilities; leased equipment for short periods of time without fully considering the savings from purchasing or long term leasing; and considered primarily mainframe manufacturers as sources of equipment supply, while giving little consideration to reduced-price sources such as leasing firms, used computer suppliers, and independent manufacturers of peripheral equipment. The report recommends that Federal agencies establish consistent and economical acquisition procedures, and that grantor agencies be required to ensure grantee compliance. New procedures may indirectly impact private (e.g., university) as well as state and local government grantees.

## NBS AND ADTS TO JOINTLY DEVELOP COMPUTER INTERFACE STANDARDS

The Institute for Computer Science and Technology (ICST) in the National Bureau of Standards (NBS), and the Automated Data and Telecommunications Service (ADTS) in the General Services Administration (GSA) have announced that they will jointly undertake an effort to develop computer interface standards; one desired result of the program is to facilitate the competitive Federal procurement of computer peripheral equipment.

ICST's overall charter is to develop standards related to information processing, and ADTS is responsible for automated data processing equipment procurement throughout the Federal government. The NBS/GSA program will: assess Federal government experience with multivendor computer systems and produce a report to the agencies; produce technical guidelines to assist Federal agencies in the planning, selection and operation of multivendor systems; analyze comparatively the device level interface employed in high density disk drives; and evaluate the technological and economic impact of computer interface standards in the international, national and Federal sectors.

## NBS SOLICITS COMMENTS ON DATA ENCRYPTION ALGORITHM

Pursuant to its statutory authority to establish Federal ADP Standards, the National Bureau of Standards is developing a standard data encryption algorithm to be recommended for Federal use. The purpose of the algorithm is to allow for compatibility of encrypted data. NBS points out that cryptographic devices implementing the standard may be covered by patents held by IBM, "which has agreed to grant non-exclusive, royalty-free licenses;" and that devices relating to the standard may be subject to export control. AFIPS societies may submit comments to the Associate Director for ADP Standards, Institute for Computer Sciences and Technology, National Bureau of Standards, Washington, D. C. 20234, or to the AFIPS Washington Office. Deadline for receipt of comments by NBS is October 30, 1975. The specification for the data encryption standard may be found in the Federal Register of August 1, 1975 at p. 32395; alternatively, copies may be obtained through the AFIPS Washington Office.



### RECENT EFTS DEVELOPMENTS

The bill introduced in the House by Rep. St. Germain (Washington Report, 8/75), which would limit installation of remote teller terminals to a financial institution's home state and within 25 miles of its headquarters or 10 miles of a branch, has apparently died in committee. While the measure to limit installation of such terminals has been, therefore, essentially rejected by the Senate, a Federal district court in Washington ruled in July that remote teller terminals constitute branch banks and are subject to laws governing branch banking. The decision, if it withstands the appeal being requested in the U. S. Comptroller of the Currency, will effectively prohibit future bank installation of such terminals, and will cause operation of existing installations to be discontinued.

### NEW BILL INTRODUCED TO CONTROL FEDERAL CRIMINAL JUSTICE INFORMATION SYSTEMS

Sen. Tunney and Rep. Edwards have introduced identical bills (H.R. 8227 and S. 2008) to control Federal criminal justice information systems. The bill is a compromise incorporating features of legislation introduced earlier this year. It would allow only conviction records to be distributed without restriction to law enforcement agencies; arrest and acquittal records could be disclosed only for specific purposes (e.g., the investigation of a specific crime) and only to authorized personnel. Further, the bill would create a Commission on Criminal Justice Information, composed of members of state and local law enforcement agencies, which would implement and oversee enforcement of the act. While the FBI has been attempting for some time to establish a law enforcement communications system interconnecting local police departments throughout the country, the Commission would have the authority to modify or terminate the FBI plan.

### AIR FORCE DESCRIBES EMPHASIS ON SOFTWARE ENGINEERING

General Sam Phillips, Air Force Systems Commander, has described a new major emphasis on software engineering in the procurement of weapons-systems computer software by the Department of Defense. The approach described would require software to be engineered in much the same way that present procurements engineer hardware; greater effort would be devoted to work breakdown structures, milestones, technical review of contract work, and software reliability assessment.

### FEDERAL GOVERNMENT INFORMATION SOURCES FOR CURRENT RESEARCH IN INFORMATION PROCESSING

AFIPS societies should be aware of the information resources of the Smithsonian Science Information Exchange (SSIE) and the National Technical Information Service (NTIS). The former organization provides information on ongoing or recently completed research projects, the latter on recently published research reports; both have developed on-line data bases.

In the area of information processing, SSIE receives project descriptions from the National Science Foundation, the National Aeronautics and Space Administration, the Department of Defense (unclassified data), and other public and private groups. The active file covers the last two government fiscal years, and contains descriptions of approximately 1300 projects in computer hardware research, 800 in computer software, and 450 in information science theory and applications. In most cases

the record for each project contains a 200 word description of the work to be performed. Information services include custom searches performed on-line by the SSIE staff, (\$50.00 for the search and first 50 records, \$10.00/50 records thereafter) and Research Information Packages (pre-designed searches - about \$35.00). Contact SSIE at Room 300, 1730 M Street, N.W., Washington, D. C. 20036, telephone (202) 381-4211, for further information.

The NTIS on-line data base consists of Federally sponsored research reports completed from 1964 to date. Each record represents a Technical Report Summary averaging 250 words. NTIS information products include the custom on-line NTISearch (\$100.00 for the search and first 100 records, \$25.00/100 records thereafter), and Published Searches (standard NTISearch's - \$25.00). NTIS also publishes Weekly Government Abstracts, which carry summaries of research reports as they are made available to the public; subjects include: Computers, Control & Information Theory; Communication; and Library & Information Sciences. Contact NTIS at 5285 Port Royal Road, Springfield, Virginia 22161, telephone (202) 967-4676, for further information.

#### NEWS BRIEFS

- After heavy debate on both NSF funded projects and the peer review system, Congress has passed the NSF authorization bill for FY76; the bill passed without the proposed Bauman amendment which would have required prior Congressional approval of NSF research grants. The FY76 authorization is a 2.6% reduction (in absolute dollars) from FY75, but NSF transferred about 6% of its research to ERDA before FY76 began.
- OSIS and NTIS have published the Federal Scientific and Technical Communications Activities: 1974 Progress Report. Order No. PB-242 318, \$5.25 NTIS; Dept. of Commerce, Springfield, Virginia 22151.
- Hearings, Dept. of Commerce: Domestic and International Business Administration, Computer Systems Technical Advisory Committee, Technology Transfer Subcommittee, September 9; Licensing Procedures Subcommittee, September 10; Hardware Subcommittee, September 16. National Bureau of Standards: Federal Information Processing Standards Coordinating and Advisory Committee, September 17. Contact AFIPS Washington Office for details.
- Rep. Staggers has introduced legislation which would authorize new telecommunications R & D.
- Rep. Morris Udall has proposed legislation which would create a Competition Review Commission to assess competition in major economic sectors, including "electronic computing and communication equipment."

#### AFIPS IN WASHINGTON

#### AFIPS BECOMES CORRESPONDING SOCIETY OF NATIONAL RESEARCH COUNCIL

AFIPS President Anthony Ralston has accepted an invitation from the National Research Council (NRC - the principal operating agency of the National Academy of Sciences and the National Academy of Engineering) to become a corresponding soci-

ety of the newly-formed Assembly of Mathematical and Physical Sciences (AMPS). AFIPS was formerly an NRC affiliated organization, but a recent NRC reorganization has required a restructuring of prior society relationships. Affiliation of AFIPS with one NRC assembly does not preclude affiliation with others, such as the Assembly of Behavioral and Social Sciences.

In NRC tradition, AMPS activities will consist of both direct responses to research requests initiated by Federal agencies, and the undertaking, on its own initiative, of projects which are deemed to be of national interest. In making the invitation to AFIPS, AMPS Chairman Norris E. Bradbury said, "it is essential that serious consideration be given [by AMPS] to both the benefits that can accrue to the Assembly Program through interaction with the professional organizations... [and] contributions that the Assembly, in turn, can make to these organizations."

#### AFIPS SOCIETY PRESIDENTS ASKED TO DESIGNATE WASHINGTON OFFICE LIAISON

AFIPS has asked its society presidents to each designate a liaison to the AFIPS Washington Office. Persons designated will act as a primary working contact for the Office, providing access to subject area experts within each society, providing nominees for various panels, relaying disseminated information to appropriate points within each society, and providing feedback regarding the Office and the issues with which it deals.

#### AFIPS WASHINGTON ACTIVITIES COMMITTEE MEETS TO CONSIDER WASHINGTON OFFICE PROJECTS

In responding to its fundamental charter to facilitate communication between the AFIPS societies and the Federal government, the AFIPS Washington Office will become involved in certain project-oriented activities. The AFIPS Washington Activities Committee met in Washington on July 23 to consider a list of 11 unsolicited proposals (including several on a funded basis) received from Federal agencies, for projects which the AFIPS Washington Office might undertake, initiate or facilitate. As a result of the meeting, 6 of the proposals are being further investigated, for possible final approval by the Committee. In addition, presidents of the AFIPS societies have been asked to submit similar proposals.

#### COMMENTS PLEASE!

The content and format of the AFIPS Washington Report are in a formative and experimental stage. Your comments will be of great assistance in making this publication responsive to the needs of your society.

<p>AFIPS societies have permission to use material in the <u>AFIPS Washington Report</u> for their own publications, except that where an article title appears with an (*) clearance must first be obtained from the AFIPS Washington Office.</p>
--



### FCC APPROVES WESTERN UNION REQUEST TO PROVIDE PACKET-SWITCHED SERVICE

The FCC has approved a request from Western Union International to provide a packet-switched service between the United States and the United Kingdom, for the Advanced Research Project Agency (ARPA) in the Department of Defense. The service is experimental in nature, and will be the first transatlantic application of packet-switching technology. It will be used as a basis for gaining experience in transmitting between two packet networks (the second network being the Experimental Packet-Switched System in the United Kingdom), and to explore the use of satellites in international networks.

### NBS ANNOUNCES NEW COBOL STANDARD

The Department of Commerce has approved a new Federal Information Processing Standard (FIPS) 22-1, which makes Cobol-74 the new language standard applicable to all Federal agencies. Cobol is the only programming language for which a Federal standard has been established. It is maintained on a voluntary basis, and is presently used by 8 government agencies. The new standard will require Cobol compilers used by the Federal government to comply with the 1974 Ansi Cobol specifications, and vendors will be required to categorize their compilers within one of four NBS levels, each of which consists of a specific set of Ansi "functional processing modules."

### PROGRAM ERROR GENERATES MASSIVE SOCIAL SECURITY OVERPAYMENT

The commissioner of the Social Security Administration has testified before an oversight committee of the House Ways and Means Committee that Social Security overpayments of \$461 million have been identified, and that the actual total may be as high as \$800 million. The errors were made largely or entirely through the computer system which supports the Supplemental Security Income (SSI) program. Changes in a complex statutory scheme have caused a haphazard development of SSI software, but the agency also admits to a lack of internal control, as well as a lack of coordination between systems or between programmers working on the same system. The Commissioner testified that many of the erroneous transactions are "literally beyond anybody's direct control." The errors have also led to concern that the system is vulnerable to fraudulent abuse by agency employees.

### PRIVACY PROTECTION STUDY COMMISSION MEETS IN WASHINGTON

The Privacy Protection Study Commission met in Washington on September 8, with an agenda which included presentations from Federal government groups and prospective contractors. In response to a suggestion by chairman David Linowes, the Commission resolved to create a committee on Freedom of Information and Privacy, chaired by Minnesota State Sen. Robert Tennesen. Executive director Carole Parsons enumerated a list of areas possibly appropriate for the Commission's attention, which included: mailing lists; private sector usage of universal identifiers; voluntary private sector compliance with Federal regulations; data collection criteria; credit card and reservation systems; Freedom of Information Act litigation; health and medical records; multi-jurisdictional data systems; consumer reporting services; credit issuance and insurance; statistics and research; social services; employment and personnel matters; oversight, enforcement and remedies regarding privacy policies; international implications (including multi-national corporations); cost factors in implementing privacy safeguards; and the Federal-state relationship in privacy regulation.

The Commission directed Parsons to initially look into credit cards, mailing lists, universal identifiers and the Federal-state relationship.

#### TUNNEY HEARINGS ON WHITE HOUSE COMPUTERS

The Senate Subcommittee on Constitutional Rights, chaired by Sen. John Tunney, held fact-finding hearings on September 9 to investigate computer usage (pertaining to personal data files) by the White House and the Federal Preparedness Agency (FPA). Tunney indicated that the investigation could lead to legislation controlling the use of surveillance technology. Witnesses for the White House Office of Management and Budget, and FPA, testified that their computers were not capable of direct communications with other agency computers, and that there had been no improper use of their systems. Tunney nonetheless expressed concern regarding accountability and control in the use of such systems. In particular, he pointed to the lack of knowledge on the part of White House witnesses concerning the data base content in the FPA computers at Mt. Weather, while the director of that system had indicated that its data base content was a matter for the discretion of other agencies.

#### NEWS BRIEFS

- The Commerce Department has announced that U.S. Exports of computers and related equipment totalled \$555 million during the first quarter of this year; imports for the same period totalled \$32 million.
- The White House Office of Telecommunications Policy has released a privacy study which evaluates privacy safeguards and provides recommendations.
- Brig. Gen. Walter E. Adams has been named Commander, U. S. Army Computer Systems Command at Ft. Belvoir, Virginia; succeeding him as Deputy Commander will be Brig. Gen. Jack L. Hancock, formerly of the Defense Communications Agency.
- The U.S. Comptroller General has recommended that the Navy take measures in several areas to improve management of its data processing programs.
- The General Services Administration has solicited (RFP-CDPA-76-1) proposals to develop ADP management guidelines for Government executives and managers.

#### AFIPS IN WASHINGTON

##### PRIVACY

As a result of interactions to date, the Washington Office has received specific suggestions from both the Privacy Protection Study Commission and the White House Domestic Council Privacy Committee regarding assistance which AFIPS might provide. Our next activity will be to structure a group of individuals from the AFIPS societies who are willing to make a commitment to providing this assistance,

##### FEDERAL COMMUNICATIONS COMMISSION BRIEFINGS

The Washington Office has instituted a series of briefings to the Federal Communications Commission, beginning with informal presentations by AFIPS experts visiting Washington. A near-term objective in this area is to provide a more comprehensive

briefing to the Commission, describing broadly how technological developments in, computing will affect communications and ultimately affect the regulatory responsibilities of that agency.

### FEDERAL COMPUTER NETWORKS AND PERSONAL DATA FILES

The use or potential use of Federal computer networks to exchange personal data files has recently been the subject of attention by both Sen. Tunney's Subcommittee on Constitutional Rights, and NBC news. Earlier this year, Ford Rowan of NBC produced a series of national news stories based on his investigation of Federal networks, particularly those in the defense and intelligence communities. With the objective of providing appropriate input from the computing profession, the AFIPS Washington Office arranged for Mr. Rowan to interview Prof. Bernard Galler and Dr. Willis Ware; these interviews are expected to appear on the NBC Nightly News.

### GENERAL INFORMATIONAL ACTIVITIES

In addition to producing the AFIPS Washington Report, recent activities have included: the development of a mechanism to disseminate NSF program solicitations from both the Computer Science Section and the Office of Science and Information Service; providing information in response to individual requests from AFIPS constituents; and providing direct briefings to the AEDS and IEEE Computer Society boards which have recently met in Washington. In providing information to the Federal government, the Washington Office has recently responded to requests from the Federal Communications Commission, the Library of Congress, and the Domestic Council Privacy Committee.

### EXPLORATORY ACTIVITIES

An important concept in the Washington Office charter is that the Office will function as an early warning mechanism with regard to developments in the Federal government. The objective is to permit AFIPS societies the opportunity to participate in such developments, rather than responding to them as faits accomplis. Accordingly, the Washington Office devotes substantial resources to attending various hearings and meetings, and scanning on a daily basis such publications as the Federal Register, the Congressional Record and various commercial reporting services.

Recent exploratory meetings have been held with several groups which have indicated a definite interest in access to technical information through AFIPS, e.g., the Congressional Office of Technology Assessment, the Air Force Systems Command, and the Office of Automated Data Processing Management in the General Services Administration. Continued liaison with congressional committees has permitted the Washington Office to alert AFIPS to major anticipated hearings, such as those to be held this fall by the House Committee on Science and Technology on (1) technology transfer and (2) the R & D programs of the National Science Foundation (including its program in computer research).

---

AFIPS societies have permission to use material in the AFIPS Washington Report for their own publications, except that where an article title appears with an (\*) clearance must first be obtained from the AFIPS Washington Office.

---





FEDERAL PRIVACY ACT IMPLEMENTATION

The Privacy Act of 1974 took effect on September 27, amidst certain unresolved questions as to its operation.

The Department of Health, Education and Welfare has characterized itself as a single agency for purposes of the Act, allowing (barring further Congressional response) the 11 separate agencies within HEW to exchange personal data files without the disclosure records required for transfers between other Federal agencies.

In a separate development, members of Congress expressed concern over the fact that some agencies were interpreting the Act to preclude Congressional access to agency files of personal data. Members of Congress frequently request such access to aid their constituents in dealing with Federal agencies. The situation was resolved, temporarily at least, by an OMB memo recommending that each agency establish Congressional access as a "routine use" of a system of records under the Act; the effect on the OMB procedure will be to obviate the need for members of Congress to obtain written consent in order to access a constituent's data file.

Finally, Sen. Kennedy has taken a strong issue with a Justice Department opinion which operated to exempt records which an agency had exempted from public access under the Privacy Act, from access under the Freedom of Information Act (FOIA) as well. In response to Kennedy's objection, the Justice Department has proposed a new regulation which would allow the FOIA to apply to records exempted from the Privacy Act, but only at an agency's discretion.

POLITICS AND PRIVACY

A number of prominent politicians have been addressing the privacy issue recently, most notably President Ford. In an address (#) at Stanford Law School, Ford spoke of the need to balance the individual right of privacy with the government's legitimate need for information related to its programs. While Ford made clear his intolerance of illegal invasions of privacy, his comments were primarily directed toward threats to privacy which result from otherwise beneficial programs; in such areas, he said, "we must protect every individual from excessive and unnecessary intrusions by a Big Brother bureaucracy." In a separate statement Ford later said that "[k]eeping only an essential minimum of these records is the most effective protection we have" against incursions on privacy.

Sen. Tunney, chairman of the Subcommittee on Constitutional Rights, recently reaffirmed his concern with privacy in a speech (#) on the Senate floor. He noted that his Subcommittee was presently moving bills which: would prohibit military spying on civilians; would provide for control of criminal records (*Washington Report*, 9/75); and would secure greater privacy protection for government employees. Tunney pointed out the need to anticipate technological threats to privacy, an endeavor in which AFIPS has already offered assistance to the Senator.

Speaking in a recent interview in *EDP Weekly*, Rep. Goldwater stated that he hoped for an attitude of support and voluntary compliance with privacy protection principles in the commercial sector. While he feels that the business sector has an incentive to be concerned with privacy as a "good business practice," he feels that a similar incentive does not exist in the area of government; he pointed out, however, that he expects the states to enact their own privacy legislation, and

that the Privacy Commission (of which he is a member) would be looking primarily at the Federal-state relationship. In a speech at the recent IEEE Computer Society COMPCON, Goldwater also urged the information processing community to provide technical input as a basis for reasonable legislation.

#### CONTROVERSY ON DEFENSE IR&D PROGRAM

The Department of Defense Independent Research and Development (IR&D) program has been the subject of controversy in hearings before the Senate Armed Services Subcommittee. The program permits defense contractors to charge a part of their general R & D programs as overhead on defense contracts; its cost in 1974 was over \$800 million dollars.

Proponents of the program argued that it allows contractors to keep abreast of current technological developments, and that it allows the military to buy advanced electronic systems at a lesser cost than if developed under a directly funded R & D program. Critics of the program, however, testified that it allows firms to charge part of the cost of developing commercial projects to their military contracts; Admiral Hyman Rickover, head of the Navy Nuclear Propulsion Program, recommended that the program be eliminated.

#### COMPTROLLER OF CURRENCY EFTS RULING ENJOINED FROM IMPLEMENTATION

The Comptroller of the Currency has suspended his December, 1974 ruling (#) that Customer-Bank Communication Terminals (CBCT's) are not branch banks within the meaning of the laws governing national banks. A decision last July in the Federal District Court in Washington (*Washington Report*, 9/75) had enjoined further implementation of the ruling, but it remained in effect while the Comptroller requested a stay of the District Court decision, pending appeal; on October 10 the stay was denied and the ruling immediately suspended.

#### PRESIDENT APPOINTS EFTS COMMISSION

President Ford has appointed the non-statutory members of the EFTS Commission, over one year after the enactment of the statute (#) creating the Commission. As a result of the delay the Commission will have less than a year to complete its work, unless the Congress passes an amendment (presently pending) which would extend its period of activity. William B. Widnall, former Congressman and ranking Republican on both the House Banking and Currency Committee and the Joint Economic Committee, has been nominated as chairman; the Senate Banking Committee held brief confirmation hearings on October 23, and confirmation was expected (at press time) by November 1.

Members representing the financial sector are Richard D. Hill (First National Bank of Boston), Verne S. Atwater (Central Savings Bank of New York), and Roy G. Green (Fidelity Federal S & L). State banking officials appointed were James E. Faris (Indiana) and William B. Lewis (New Jersey), and Herb Wegner was appointed as a trade association executive. Other nominees were Freyda P. Koplow, (former Massachusetts Commissioner of Banks), Fairfax Leary, Jr. (Temple University law professor); Almarin Phillips (U. of Pennsylvania); Gordon R. Worley (Montgomery Ward); George W. Waters (American Express); John J. Reynolds (Interbank Card Association); and Ralph F. Lewis (Harvard Business Review).

NSF ACTIVITIES

**Recent Events.** The National Science Foundation held an October 28 conference at Case Western Reserve University on Production Research and Industrial Automation; part of the NSF Research Applied to National Needs Program, the conference focused on technological improvement of productivity. NSF also has awarded a grant to John W. Hamblen, chairman of the University of Missouri Computer Science Department, to conduct an Inventory of Computer Activities and Related Degree Programs in U.S. Higher Education.

**Funding Opportunities.** NSF is seeking proposals from U.S. institutions, for five day regional conferences, on subjects of current research interest in the mathematical sciences. The Foundation has also reopened its annual competition for faculty fellowships in Science Applied to Societal Problems; awards will be offered in all scientific fields, including computer science and mathematics, and applications (#) are due by February 6, 1976.

ASSISTANT SECRETARY OF COMMERCE ON COMPUTER-AIDED MANUFACTURING

Speaking at the recent Second International Computer-Aided Manufacturing (CAM) Standards workshop in Washington, Dr. Betsy Ancker-Johnson, Assistant Secretary of Commerce for Science and Technology, described the potential of computer-aided manufacturing for increasing national productivity. In a speech reported by *EDP Weekly*, she stressed the opportunities related to the standardization of CAM Systems, pointing out that efficient applications will depend on standards in data base formats, computer languages and interfaces between system components.

DATA COMMUNICATIONS ISSUES AT THE FCC

**Telenet and Tymshare.** Telenet has filed a request with the FCC, seeking a ruling that Tymshare be required to operate as a regulated common carrier, alleging that Tymshare's policies do not conform with FCC rules on computer-based communication services. While both companies provide packet-switched network services, only Telenet has filed with the Commission as a common carrier. Regulation of such value-added networks is also an issue in the current FCC "Resale and Sharing Docket;" this inquiry (#) is investigating whether non-regulated carriers which purchase communication services at bulk discounts (and subsequently resell or share them) should be treated as common carriers.

**Aetna joins CML Satellite.** IBM, Comsat General, and Aetna Life & Casualty have proposed to the FCC a partnership arrangement in which each would become an equal owner in CML Satellite, a corporation being organized to provide satellite data communications; the proposal corresponds to the "balanced option" for CML, approved by the FCC in an earlier ruling. The earlier FCC decision allowing an IBM-Comsat General joint venture remains the subject of litigation by three existing satellite carriers, Western Union, RCA Global Communications, and American Satellite.

NEWS BRIEFS

The National Academy of Sciences has published a report (#) recommending establishment of a *National Resource for Computation in Chemistry*.

- Lear Siegler has agreed to an FTC consent decree, based on allegations of unfair and deceptive sales practices, requiring *refund of computer course tuitions to eligible former students.*
- The National Bureau of Standards has received a *National Science Foundation grant to study the impact of copyright and other laws on the economics of technology related to scientific and technical information systems.*
- The White House Office of Telecommunications Policy (OTP) *has formed a committee to consider long-range export policy issues; the group will be coordinated by the OTP Assistant Director for International Communications, William L. Fishman.*
- President Ford *has nominated Charles Slichter to the National Science Board of the National Science Foundation.*
- The National Academy of Sciences has published its current report (#) of *Fellowship and Research Opportunities in the Mathematical Sciences.*
- The General Accounting Office *has released reports which (1) criticize the Office of Management and Budget for not adequately centralizing computer procurement, (2) recommend improved management of information systems development in the Federal Aviation Administration, and (3) recommend cancelling procurement of a major Department of Agriculture system, due to inadequate agency planning.*
- Complete sets of the *Federal Information Processing Standards (FIPS)* are now available from the National Bureau of Standards at \$46.00 each.
- The Computer and Business Equipment Manufacturers Association has published a series of *brochures on privacy (#)*, discussing issues and presenting statements by major spokesman within, and outside the Federal government.

### AFIPS IN WASHINGTON

#### AFIPS BRIEFS DOMESTIC COUNCIL PRIVACY COMMITTEE DIRECTOR

On October 3rd, representatives of AFIPS societies provided a briefing to Quincy Rodgers, executive director of the White House Domestic Council Privacy Committee. The briefing to Rodgers was primarily in anticipation of a vice-presidential round-table on Privacy and Information Policy. AFIPS participants were: Daniel McCracken (ACM), Charles Meadow (ASIS), Bill Moser (DPMA), and Bruce Peters (IEEE Computer Society).

The objective of the briefing was to provide Rodgers an assessment, from the prospective of professionals in the information processing field, of issues related to Federal government information policy. Vice President Rockefeller, chairman of the Domestic Council Privacy Committee, is concerned with the development of a comprehensive policy which would view these issues in a broad perspective, in contrast to the *ad hoc* fashion in which they are presently handled by the Federal government.

#### COORDINATING AFIPS COMMITTEES AND WASHINGTON ACTIVITIES

Since several existing AFIPS committees address areas of continuing interest in Washington, an effort is underway to closely coordinate such committees with the activities of the AFIPS Washington Office and to make the facilities of the office available in connection with relevant committee work. AFIPS committees initially identified for close liaison include those on Privacy, EFTS and Statistics.

AFIPS WASHINGTON ACTIVITIES COMMITTEE MEETS IN WASHINGTON

An AFIPS Washington Activities Committee meeting was held in Washington on October 8, attended by AFIPS President Tony Ralston and Executive Director Robert Rector. In addition to conducting its regular review and assessment of Washington Office activities, the Committee resolved to pursue specific projects with the Federal Communications Commission (FCC) and the Institute for Computer Sciences and Technology (ICST) at the National Bureau of Standards; both of these projects are presently in an exploratory phase. The objective of the FCC project is a major briefing to the Commission, assessing the impact of developments in computer communications on FCC regulation and the ICST project is oriented toward an assessment of the scope, character and impact of computer science as a discipline.

NEW WASHINGTON REPORT POLICIES

At its recent meeting, the Washington Activities Committee established three major policies for the *AFIPS Washington Report*:

Subscriptions to the *Washington Report* shall be, for the present, available upon request. While the publication is viewed primarily as a member service to AFIPS societies, it is available to non-AFIPS groups and individuals as well. It is anticipated that subscription charges will be imposed at a future date, with appropriate differentials for AFIPS societies and society members.

Key documents discussed or cited in the *Washington Report* will be made available through the Washington Office upon request, where feasible; availability will be indicated by a "(#)" symbol in the text of the *Washington Report*.

In appropriate instances, the *Washington Report* will solicit comments and provide a forum for discussion of particular events or programs in the Federal government.

In addition to the foregoing services, AFIPS societies can, of course, contact the Washington Office for assistance in connection with any matters discussed in the *Washington Report*; it is indeed hoped that articles will precipitate both inquiries and comment.

AFIPS PLANS WHITE HOUSE BRIEFING

A joint effort by AFIPS Executive Director Robert Rector and the AFIPS Washington Office has resulted in tentative plans for a February 5, 1976 White House briefing to senior officials of the AFIPS societies. AFIPS will be briefed by various executive agency spokesmen in areas of particular interest to the information processing field; prospective topics include research and development, technology transfer, EFTS, computer communications, privacy, Federal usage of computers, and standards. In addition, AFIPS may undertake to brief the Administration on issues as viewed by professionals in information processing. Comments on proposed topics are solicited from the AFIPS societies.

AFIPS societies have permission to use material in the *AFIPS Washington Report* for their own publications, except that where an article title appears with an " \* " clearance must first be obtained from the AFIPS Washington Office. Documents indicated by the symbol "(#)" are available on request to the AFIPS Washington Office.

# Washington Report

74

\*\*\*\*\*  
American Federation of Information Processing Societies Inc Suite 420 2100 L Street NW Washington, D C 20037 202-296 0590

Vol. I, No. 5.

December, 1975

## WASHINGTON DEVELOPMENTS

### FCC APPROVES DIRECT INTERCONNECTION OF TERMINAL EQUIPMENT

The Federal Communications Commission (FCC) has ruled that users may directly connect terminal equipment to the telephone network without the use of carrier-supplied connecting arrangements, provided they comply with FCC requirements. The ruling (#) is to become effective April 1, 1976.

*Impact of the decision.* The ruling will permit users to connect computer terminal equipment to the network without the necessity of either a modem supplied by the common carrier (generally AT&T) or a telephone company data access arrangement (DAA); the DAA had previously been required if a Bell modem were not used. While circuitry similar to the DAA will still have to be incorporated in customer-supplied equipment, it is expected to be considerably less expensive to users than present AT&T lease charges.

*History.* The FCC ruling requiring the use of telephone company connecting arrangements for user-supplied terminals has been the subject of controversy ever since its implementation after the Carterfone decision (which allowed the connection of customer-provided equipment) in 1968. The common carriers have argued that such arrangements are necessary to protect the network against potential harms, such as those identified by a 1970 National Academy of Sciences study: hazardous voltages, excessive signal power levels, excessive longitudinal imbalance, and improper network control signaling. Opponents maintain, however, that the telephone companies have insisted on carrier-supplied access arrangements to protect their own revenues.

*Registration program.* The FCC will allow interconnection only if it is done through either protective circuitry registered with the FCC, or directly through equipment which is itself registered. The Commission has also required that carrier-supplied terminal equipment be registered (a requirement not generally imposed on common carriers) in order to enhance network protection, insure competitive equality (between carriers and non-carriers) in the manufacture of such equipment, and to provide a "benchmark" against which to judge non-carrier applications.

*Possible appeal.* AT&T is expected to appeal the FCC ruling, which may delay its effective date. Further, the ruling applies only to the technical aspects of interconnection; a separate proceeding (Docket 20003) is underway to examine the potential economic harm from competition in this area. A reversal of the technical ruling would appear unlikely on economic grounds, since data communications devices account for only the small portion of AT&T revenues.

OTP REPORT ON SOCIAL ISSUES IN EFTS

The White House Office of Telecommunications Policy (OTP) has released a study on the non-economic implications of EFTS, entitled "Value Choices in Electronic Funds Transfer Policy." In transmitting the study to the Vice President, OTP Acting Director John Eger said "both because of our particular mandate to evolve policy relating to the interconnection of computers with telecommunications, an interconnection which is the necessary foundation of any EFT system, and because of our concern for informed and effective formulation of policy in the executive branch, OTP has begun to scrutinize closely the increasing range of Federal government activity in this area. . . . While many of the most significant economic questions have been raised, critical non-economic issues have not been addressed such as the desirability of unfettered government access to personal records either as a user or an operator of any EFT system." A primary significance of the report is the indication that OTP is squarely concerned with the social impact of EFTS. This subject is presently considered (or planned to be considered) only peripherally by groups such as the Privacy Commission, the EFTS Commission, or the Federal Communications Commission.

WHITE HOUSE SCIENCE ADVISER BILL PASSES HOUSE

A new bill to establish a presidential science adviser, H.R. 10230, has been passed (362-28) in the House of Representatives. The legislation, drafted cooperatively by the Ford Administration and House science leaders, is a revision of H.R. 9058 (*Washington Report*, 9/75).

In its present form, the bill (1) establishes a national policy for science and technology, (2) establishes an Office of Science & Technology Policy (OSTP) in the White House, and (3) establishes a Federal Science & Technology Survey Committee (the Survey Committee) in the White House. The Survey Committee will have two years to analyze Federal science and technology efforts and report its findings to the President, who must subsequently review and transmit the report to Congress with his recommendations. The director of OSTP will serve as the President's Science Adviser, and as chairman of the Survey Committee.

Despite the likelihood of this bill becoming law, there remains serious concern in the science community (e.g., William Carey's editorial in the November 21 issue of *Science*) that science budgets may suffer substantial cutbacks in President Ford's program to reduce Federal expenditures by \$28 million.

NEW NSF ADVISORY GROUPS

President Ford has created two new science advisory groups within the National Science Foundation, to advise him on planning for the proposed Office of Science & Technology Policy (see above summary of H.R. 10230). These are, respectively, the Anticipated Advances in Science & Technology Advisory Group, and the Contributions of Technology to Economic Strength Advisory Group. The former group, headed by Dr. William O. Baker (president, Bell Labs) will advise the President on national policy implications of developments in science and engineering; the latter group, headed by Dr. Simon Ramo (board vice chairman, TRW) will advise on improving the utilization of technology to foster economic strength.

In addition to the advisory group chairmen, other members related to the computing field include Lew Branscomb (Vice President and Chief Scientist, IBM), Joseph Charyk, (president, Comsat) and Patrick Haggerty, (board chairman, Texas Instruments).

PRIVACY COMMISSION ACTIVITIES

The Commission is presently investigating eight topical areas. It has thus far produced staff reports in four of these, "The Use of Mailing Lists in the Private Sector," "The Use of the Social Security Number in the Private Sector," "Disclosure of Federal Income Tax Returns to Third Parties," and "Credit Card Record-Keeping: The Informational Privacy Issues," and it has immediate plans to look into the remaining areas: consumer credit reporting, employment records, social services, and statistical research. The Commission presently receives input from its own staff (which will be supplemented by contractual support of about \$50 thousand per year), industrial groups and non-profit organizations such as AFIPS.

The Commissioners recently indicated that they will not postpone their recommendation until their final report is due (June, 1977), but will publish proposed recommendations for public comment as the Commission proceeds.

NEWS BRIEFS

- The *NSF Advisory Panel for Computer Science & Engineering* met recently to discuss NSF programs in Software and Programming Systems, Software Quality Research, and the general program in computer science.
- The *Federal Home Loan Bank Board*, in response to pressure from the Justice Department, has agreed to abstain from advocating government-sponsored EFT, and to support private sector development of EFTS systems.
- The Association of Data Processing Service Organizations (*AD<sup>2</sup>PSO*) has filed a brief in the *Johnston software patent case* before the Supreme Court (*Washington Report*, 9/75) supporting software patentability, and opposing the brief filed earlier by the Computer & Business Equipment Manufacturers Association (*CBEMA*).
- The *National Science Foundation* is seeking proposals for participation in U.S.-U.S.S.R. activities in the application of computers to management; present joint activities are (1) econometric modeling, (2) computer analysis of economics in management of large systems, (3) applications of computers to management of large cities, (4) theoretical foundations for software applications in economics in management, and (5) computer-aided refinement of decision making, and education of high-level executives.
- The *Stanford Research Institute* has received a \$275,000.00 grant from the Experimental Technology Incentive Program in the National Bureau of Standards, to develop guidelines for improving research and development planning in fifteen non-defense Federal agencies.
- The House Committee on Science & Technology has published its *Annual Report on Federal R & D Programs* (#).
- The Law Enforcement Assistance Administration has published a *compendium of state laws which govern security and confidentiality of criminal justice information systems*.
- Attorney General Levi has *denied permission to the FBI to proceed with the development of its computerized message-switching system*; pending passage of further legislation.



AFIPS IN WASHINGTONAFIPS PROVIDES CONGRESSIONAL TESTIMONY ON TECHNOLOGY TRANSFER

At the request of the House Committee on Science & Technology, Subcommittee on Domestic and International Scientific Planning and Analysis, AFIPS provided witnesses to testify at recent hearings on technology transfer to nations in the Organization of Petroleum Exporting Countries (OPEC). AFIPS provided two witnesses, Prof. J.C.R. Licklider of MIT and Prof. Harry Huskey of the University of California at Santa Cruz, who testified specifically on transfer of computer technology.

Dr. Licklider distinguished in his remarks eight aspects of technology subject to export: hardware, software, systems, networks, services, information, education and individual expertise. He urged that while computer services and access to computing resources may be appropriate for export, that exports of computer hardware should be scrutinized for their national security implications. Prof. Huskey pointed out that information technology can be most helpful to developing nations, and tends to have a stabilizing effect on these countries; he cited the example of Management Information Systems in food distribution. He stated further that encouraging utilization of the technology by developing nations is beneficial to the U.S. economy and stimulates domestic R & D (which in turn maintains our relative technological advantage). Transcripts of the hearings (#) will be published in about one month.

PRIVACY COMMISSION REQUESTS AFIPS EXPERTISE

The Privacy Protection Study Commission has made a request of AFIPS to provide a panel of experts familiar with certain aspects of the use of the Social Security Number (SSN) as a universal identifier. The Commission is interested in communicating with three specific categories of individuals:

- (1) managers of record keeping systems who are familiar with current private sector usage of the SSN,
- (2) persons directly familiar with an operation which has recently converted (perhaps in anticipation of private sector legislation) from the SSN to some other numbering system, and
- (3) individuals in state and local governments familiar with the impact of Section VII of the Privacy Act, which makes it unlawful for such governments to deny benefits to individuals refusing to disclose their SSN.

In response to this request, the AFIPS Washington Office has contacted the liaison from each AFIPS society asking them to provide nominees to the AFIPS panel.

AFIPS societies have permission to use material in the *AFIPS Washington Report* for their own publications, except that where an article title appears with an " \* " clearance must first be obtained from the AFIPS Washington Office. Documents indicated by the symbol "(#)" are available on request to the AFIPS Washington Office.

# Washington Report

\*\*\*\*\*  
American Federation of Information Processing Societies, 1101 19th Street, N.W., Washington, D.C. 20036 202 296 0590

Vol. II, No. 1

January, 1976

## WASHINGTON DEVELOPMENTS

### NATIONAL ACADEMY OF SCIENCES FORMS AD HOC COMPUTER SCIENCE PLANNING GROUP

The Assembly of Mathematical and Physical Sciences (AMPS) in the National Academy of Sciences (NAS) has recently formed an ad hoc Computer Sciences Planning Group to consider activities which AMPS might undertake in that field. The Group is to consider "what aspects of this rapidly growing discipline and what problems related to federal and non-federal applications might benefit through special studies, particularly by [AMPS]."

The AFIPS Washington Office has confirmed that the formation of the Computer Science Planning Group was precipitated in part by letters earlier this year to Dr. Philip Handler (president, NAS) from Anthony Ralston and Jean Sammet, presidents of AFIPS and ACM, respectively. Both Ralston and Sammet urged Handler to consider organizational changes which would recognize computer science as a separate discipline within the National Research Council (NRC -- the NAS and the National Academy of Engineering), arguing that this recognition has already occurred within major universities and throughout most of the academic community.

*History.* There have been a number of activities within the NRC in the last ten years which relate to computer science and engineering, most recently the Computer Science and Engineering Board (CSEB). The CSEB was in existence from 1968 to 1972, chartered to assess the implications of information performing technology with regard to the public and private sectors of the United States. The National Research Council generally operates by performing studies under contract to various Federal groups, and occasionally undertakes similar studies on its own initiative; there have been no studies primarily related to information processing since the termination of the CSEB.

While the Academies have approximately a dozen computer scientists and engineers as members, the computer science discipline has not been organizationally recognized outside of existing groups in mathematics and engineering.

*Meeting agenda.* At its recent first meeting, the Computer Science Planning Group undertook a general discussion of areas which would be candidates for NRC attention, including (1) the impact of computers on society, (2) computer engineering, (3) computer science, and (4) the commercial impact of computer technology. Reports will be produced in these areas by early 1976.

*Outlook for a permanent group* While there is apparently no consensus in the Group on how to proceed, it appears highly likely that a recommendation will be forthcoming to set up a permanent computer science group within the NRC; the principal unresolved questions relate to the structure of such a group. There are presently three other groups proceeding in parallel with the AMPS group, each of which will ultimately produce a report recommending NRC activities in this field,

these are the Assembly of Engineering, the Assembly of Behavioral and Social Sciences, and the Commission on Sociotechnical Systems.

**Planning group members.** Members of the AMPS group are Gordon Bell (DEC), Ruth Davis (National Bureau of Standards), Bernard Galler (U. of Michigan), Richard Garwin (IBM), Jerrier Haddad (IBM), Richard Karp (U. of California), Joshua Lederberg (Stanford Medical School), J.C.R. Licklider (MIT), Allen Newell (Carnegie-Mellon), George Pake (Xerox), Alan Perlis (Yale), Patrick Suppes (Stanford), and Ivan Sutherland (RAND).

#### WUI AND ITT DATA COMMUNICATIONS APPLICATIONS BEFORE FCC

**WUI.** Western Union International (WUI) has received approval from the Federal Communications Commission (FCC) to furnish its International Digital Data Service (IDDS) to France, Italy, Spain and Austria. The service is claimed to provide high quality and reliability, primarily by simultaneous transmission of data by undersea cable and satellite. The FCC approval is for one year of operation, within which IDDS must submit an analysis of its service. IDDS will be required to submit a tariff proposal before beginning service, based on transmission speed (from 50 bits to 9.6 kilobits per second), transmission volume and other factors.

**ITT.** ITT Domestic Transmission Systems has filed an application with the FCC asking for approval of a domestic data communications network. The proposed service, to be known as Com-Pak, is a packet-switched system which would be capable of servicing incompatible computers and computer terminals. The network would initially serve 13 cities by 1977, eventually expanding to 24 cities. Like other value-added carriers (e.g., Telenet) Com-Pak would rely on circuits leased from common carriers. While computer-related transmissions on the network will generally be immediate, a delayed-transmission service (at a lower price) will also be available to customers for applications such as word processing.

**Related issues.** ITT World Communications has opposed the FCC authorization of IDDS, arguing that the FCC should conduct a technical inquiry on optimum methods for international digital data services, before granting the IDDS application.

On a separate topic, Western Union and other carriers have petitioned the United States Court of Appeals in Washington to reverse FCC approval of the proposed CML data communications satellite venture (*Washington Report*, 11/75), asserting that it would have monopolistic effect (such as dividing the market for satellite data communications between AT&T and CML). The petitioning firms feel the monopoly conditions which might exist subsequent to CML entry into the market could not be reversed by antitrust regulation or litigation.

#### COMPTROLLER OF CURRENCY EFTS SURVEY

While the EFTS Commission continues to organize, a recent survey released by Comptroller of the Currency, James E. Smith, indicates the extent and distribution of existing EFTS systems. According to Smith:

The survey, which had a response rate of 97 percent of 4,700 national banks, showed that fully 10 percent of the banks had at least one Automated Teller Machine. As expected, a high proportion of large banks have an EFT system - 72.9 percent of billion dollar banks and 48.4 percent of those in the half billion to billion dollar range.

However, more than half of all EFT systems are in banks with under \$100 million in deposits. A third are in banks with less than \$50 million in deposits. (Interestingly, urbanization is not the key indicator of which banks will have the machines. Washington, Oregon, Virginia, Mississippi and West Virginia rank in the top ten states having the highest proportion of banks with EFT systems. New York and Pennsylvania are 33rd and 38th in the Union respectively.)

#### JUSTICE DEPARTMENT URGES FEDERAL RESERVE BOARD TO RESTRICT ITS EFTS ACTIVITIES

The Justice Department has urged the Federal Reserve Board to modify its policy on computerized check-clearing facilities (Automated Clearing Houses -- ACH's) operated by Federal Reserve Banks. The Department maintains that the Board's proposed rule to provide only Federal Reserve System member banks with unrestricted access to ACH's would effectively discriminate against non-member banks and thrift institutions (savings and loan associations, and credit unions); further, it indicated that if ACH's offered comprehensive services without charge (e.g., processing debit items) private investment and innovation in EFTS, particularly point-of-sale systems, would be discouraged.

The Justice Department recommended that the Board restrict ACH services to applications such as payroll deposit plans, and social security payment plans; it recommended against services that would compete against point-of-sale retail financial services. It also urged the Board to adopt a pricing structure for ACH services which would reflect the full cost of providing such services to each participating financial institution.

#### WHITE HOUSE SCIENCE ADVISER DEVELOPMENTS

The bill to establish a White House science adviser, passed recently in the House (*Washington Report*, 12/75), has encountered substantial difficulty in the Senate. While the Ford Administration had urged Senate passage of a bill essentially identical to the earlier House version, the Senate is moving toward a bill less desirable to the President in that it would (1) require the science adviser to make an annual report to the Congress, thus making the President accountable for his differences with the adviser, (2) give the science adviser responsibility for funding recommendations (a task the President would prefer to have left to the executive agencies and OMB), and (3) generally give the President less flexibility in structuring the office of the science adviser. The Senate committees handling the bill are Labor and Public Welfare (Sen. Kennedy), Commerce (Sen. Tunney), and Aeronautical and Space Sciences (Sen. Moss).

The two National Science Foundation advisory groups formed by the President to assist in planning for the office of Office of Science and Technology Policy (*Washington Report*, 12/75) held their first meeting in Washington in December, at which they heard briefings from relevant Federal groups including the White House Office of Management and Budget, the Departments of State, Commerce, Agriculture, and the Federal Energy Administration. The groups were also briefed by heads of the National Academies, the Office of Technology Assessment and the National Science Foundation.

Chairing the joint meeting, Simon Ramo called for initial discussion of national science policy issues appropriate for White House attention, and asked each of the advisory group members to submit at their next meeting approximately two such issues

for further consideration. The AFIPS Washington Office plans to provide input to the advisory groups in this issue identification process; timely comments from the AFIPS societies (i.e., preferably by January 13, but otherwise as early as possible) are, of course, solicited. One advisory group member has indicated a substantial interest in Federal regulatory reform (which, with regard to the information processing field, could include such areas as computer communications, electronic fund transfer systems, privacy, technology transfer, and computer industry antitrust).

#### NEWS BRIEFS

- The General Services Administration has released its annual "Inventory of Automatic Data Processing Equipment in the U.S. Government" (#), for fiscal year 1975; while IBM still has the most installed equipment (35%), DEC was the leading vendor in 1975.
- The National Science Foundation has awarded over \$1 million in grants for studies on the impact of Federal regulatory agencies, including the Federal Communications Commission.
- The National Science Foundation has issued a solicitation for proposal. (#) for the Educational Program Restructuring program, which is to "encourage the development, testing and evaluation of new or unconventional approaches to all aspects of science instruction at the undergraduate level."
- Charles C. Joyce, former assistant director of the White House Office of Telecommunications Policy (OTP) has been named OTP special assistant for national security and emergency communications.
- The nominee for Secretary of the Air Force, Thomas Reed, comes from a present post as director of Pentagon telecommunications and command and control systems.
- Requests for comments on a proposed Federal information processing standard (FIPS) for the National Communications System have been requested by January 30, 1976; details are available from AFIPS Washington Office.
- The Office of Science Information Service in the National Science Foundation has released its Summary of Awards for fiscal year 1975 (#).
- While the *U.S. vs. AT&T* antitrust suit is delayed in court, the Senate Antitrust Subcommittee is considering legislation to reorganize AT&T; a suggested bill has been submitted by the Computer Industries Association.
- The Federal government has denied an IBM request to export a 370/158-based reservations system to the Soviet Union; a primary factor in the decision was the approximately thirty model 3330 disc drives involved in the system.
- The Computer Industry Association has recommended stronger Antitrust legislation in recent testimony relating to the Predatory Practices Act of 1975, before the House Committee on Small Business.
- The National Science Board of the National Science Foundation has solicited comments on the peer review system by circulating questionnaires (#) to several thousand prospective principal investigators and proposal reviewers.

AFIPS IN WASHINGTONAFIPS BOARD MEETING MARKS FIRST HALF YEAR FOR WASHINGTON OFFICE

At its December, 1975 meeting the AFIPS Board of Directors was given a report on the first six months of Washington Office operations. It was reported that substantial progress had been made toward creating a focus (between the AFIPS societies and the Federal government) for information related to the information processing field. The report listed several activities of particular significance:

An AFIPS briefing was provided to the executive director of the White House Domestic Council Committee on the Right of Privacy, discussing issues in "Privacy and Government Information Policy."

AFIPS provided witnesses to testify before the House Committee on Science and Technology, on computer technology transfer to the OPEC countries.

AFIPS was formally established as the association contact for the director of the National Science Foundation, on matters related to information processing.

A series of briefings and discussions were initiated with Federal groups concerned with the government role in computer communications, including the White House Office of Telecommunications Policy and the Federal Communications Commission.

In cooperation with AFIPS Headquarters, a February 1976 White House briefing has been planned for senior officials of the AFIPS societies.

The Washington Office has provided: information on Washington events to AFIPS society publications, information on AFIPS Washington activities to *Datamation* and *EDP Weekly*, and technical experts to NBC News.

Relevant to future Washington Office activity, AFIPS President Anthony Ralston recently announced that he will devote his Plenary Session address at the 1976 National Computer Conference to the relationship between science (particularly information processing) and government, discussing the prerogatives and obligations of computer scientists and technologists. "How our profession responds to this challenge [to interact with government]", he said, "should be of great importance to all of us"

AFIPS MEETS WITH WHITE HOUSE DIRECTOR OF TELECOMMUNICATIONS POLICY

The Director of the AFIPS Washington Office was recently invited to meet with John Eger, acting director of the White House Office of Telecommunications Policy. The discussion underscored the substantial number of issues of interest to both OTP and AFIPS (see *Washington Report* notes on OTP activities: 8, 9, 10 and 12/75), including computer communications (an area in which OTP has a primary mandate to formulate policy), privacy, EFTS and technology transfer. Mr. Eger

indicated interest in technical expertise available through AFIPS, and in particular, in a dialogue between his staff and AFIPS on contemporary issues and developments in computer communications.

REP MOSHER REQUESTS AFIPS COMMENT ON H.R. 214

Rep. Charles A. Mosher (Ohio), ranking minority member of the House Committee on Science and Technology, has requested AFIPS comment on an amendment to H.R. 214, a bill which in its amended form would outlaw the interception of data transmissions sent over common carriers. AFIPS comment, to be submitted by mid-January 1976, will be provided by Paul Armer, Paul Baran, Donn Parker and Keith Uncapher. Other members of AFIPS societies interested in commenting on this and similar legislation should contact the Washington Office as soon as possible.

AFIPS societies have permission to use material in the *AFIPS Washington Report* for their own publications, except that where an article title appears with an " \* " clearance must first be obtained from the AFIPS Washington Office. Documents indicated by the symbol "(#)" are available on request to the AFIPS Washington Office.

Vol. II, No. 2

February, 1976

## WASHINGTON DEVELOPMENTS

### PRESIDENT FORD PROPOSES R&D INCREASES IN FY 1977 BUDGET

*Overall R&D budget increases.* The \$395 billion budget which President Ford has submitted to the Congress for fiscal year 1977 (FY 77) contains research and development (R&D) obligations of \$24.7 billion. While this is an 11% increase in absolute dollars over FY 76, real expenditures (after inflation) will remain about constant. However, even constant R&D funding represents a significant priority, considering that the overall budget represents a \$28 billion "reduction" from the ordinary growth of the Federal budget from \$370 billion in FY 76 to \$423 billion in FY 77, and that R&D is within the 25% of the total budget which is considered "discretionary" (i.e., the remaining 75% is committed to prior obligations in various Federal benefit programs).

*Breakdown for overall R&D funding.* Of the overall R&D budget, approximately \$16 billion will be devoted to development (up 11% from FY 76), \$6 billion to applied research (up 7%) and \$3 billion to basic research (up 11% - see chart 1). The budget of the National Science Foundation (NSF) was increased more than the average with an increase of 16% in overall R&D to \$726 million in FY 77, and an increase of 20% in basic research. According to NSF, these increases reflect "the importance that the Administration attaches to basic research, and the fact that a very large proportion [86%] of the NSF budget is devoted to basic research."

The Department of Defense share of the overall R&D budget will remain constant, at about 50% (see chart 2). Within the NSF budget, approximately 75% is directed toward colleges and universities; the proposed FY 77 increases would result in an 18% increase in NSF research support activities in colleges and universities (see charts 3 & 4).

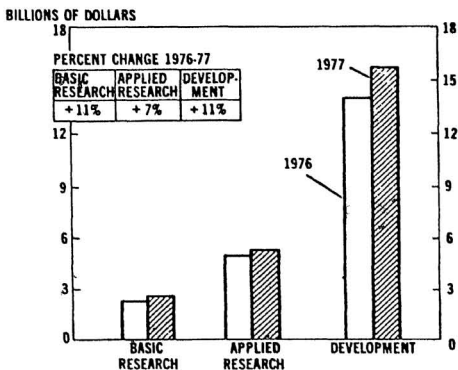
*Impact on agencies funding computer research.* The anticipated FY 77 budget for the Computer Science Section in NSF is \$15.8 million, an increase of 26% over the FY 76 budget of \$12.5 million. Mr. Kent Curtis, director of the Section, feels that computer science has fared well within NSF, not only because of steady R&D budget increases in the past, but because of a shift of funding toward computer science, giving the Section an increase substantially larger than the overall NSF increase.

The Information Processing Techniques Office in the Department of Defense Advanced Research Projects Agency is anticipated to have an FY 77 budget of \$37.7 million, a 6% increase over FY 76. In FY 77, ARPA will have substantially reduced expenditures in its programs relating to the ILLIAC IV, and the ARPANET (which is now treated as an operational network under the Defense Communications Agency). The budget of the Institute for Computer Sciences and Technology in the National Bureau of Standards will remain essentially unchanged in FY 77, at \$8.5 million.

*Congressional debate.* The President's proposed budget must now go through Congressional hearings and modifications, before enactment.



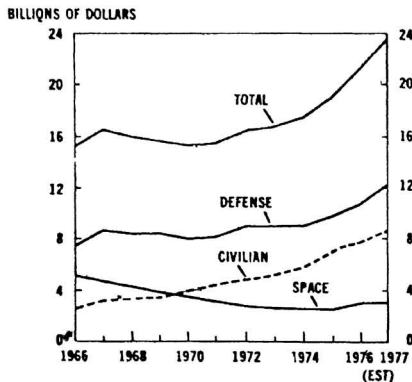
FEDERAL OBLIGATIONS FOR CONDUCT OF BASIC RESEARCH, APPLIED RESEARCH  
AND DEVELOPMENT, FY 1976 AND 1977 (ESTIMATES)



SOURCE: SPECIAL ANALYSIS P, 1977 BUDGET  
*Chart 1*

ST 12-18-1000  
1-20-76

FEDERAL OBLIGATIONS FOR CONDUCT OF  
R&D BY MAJOR PROGRAM AREA  
FY 1966-77

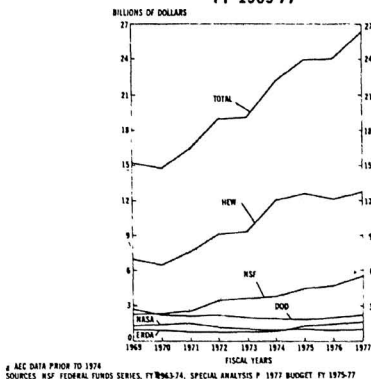


SOURCE: SPECIAL ANALYSIS P, 1977 BUDGET

*Chart 2*

ST 12-18-1000  
7-76

## FEDERAL R&D OBLIGATIONS TO COLLEGES AND UNIVERSITIES FY 1969-77



ST-A-16-1298  
1-20-76

Chart 3

## FEDERAL R&D SUPPORT TO COLLEGES AND UNIVERSITIES (MILLIONS OF DOLLARS)

DEPARTMENT OR AGENCY	OBLIGATIONS			DIFFERENCE FY 1976-77	CHANGE FY 1976-77	
	TOTAL	FY 1975 ACTUAL	FY 1976 EST.			FY 1977 EST.
	<b>TOTAL</b>	<b>\$2,399</b>	<b>\$2,407</b>	<b>\$2,635</b>	<b>+\$228</b>	<b>+9%</b>
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE		1,269	1,218	1,302	+84	+7%
NATIONAL SCIENCE FOUNDATION		447	465	550	+85	+18%
DEPARTMENT OF DEFENSE MILITARY		190	202	225	+23	+11%
ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION		135	141	166	+25	+18%
DEPARTMENT OF AGRICULTURE		108	120	128	+8	+7%
NATIONAL AERONAUTICS & SPACE ADMINISTRATION		108	107	107	-	-
ALL OTHERS		142	154	157	+3	+2%

SOURCE: SPECIAL ANALYSIS P 1977 BUDGET

ST-A-16-1298  
1-20-76

Chart 4

#### COMPUTER INDUSTRY GROUPS OPPOSE FCC APPROVAL OF AT&T DATA TERMINAL

IBM, the Computer & Business Equipment Manufacturers Association (CBEMA), and the Computer Industry Association (CIA) have all opposed AT&T's proposed tariff filed with the FCC for the Dataspeed 40 terminal device. There is little dispute regarding the actual functions of the device; the argument is focused primarily on whether such functions should be characterized as data communications or data processing. The fundamental issues, however, are (1) whether the data services embodied in the Dataspeed 40 should be subject to government regulation, and (2) whether a government-regulated monopoly (AT&T) should be allowed to manufacture such terminals and thus compete with the private enterprise computer industry. The Dataspeed 40 is a 1920 character CRT terminal and standard teletypewriter keyboard, with optional features for functions such as printing and editing.

The computer industry opponents to AT&T all cite a 1956 consent decree which prohibits AT&T from entering an unregulated industry; further, they refer to the FCC "Computer Inquiry", which ruled that common carriers may provide data processing services only through unregulated subsidiaries. The terminal manufacturers fear that the Dataspeed 40 will be priced below their competitive offerings, through cross-subsidies from other AT&T services.

#### SENATOR BYRD URGES MORATORIUM ON EXPORT OF COMPUTER TECHNOLOGY TO U.S.S.R.

In a December 18 speech (#) on the Senate floor, Sen. Robert Byrd called for a moratorium on the export of computer technology to the Soviet Union. He recommended that the Departments of State and Commerce take immediate steps to institute a program to reassess technology export, and to evaluate U.S. gains and losses in technology currently exchanged.

Byrd argued that the export of computer technology potentially threatens peace, rather than promotes it. He noted that "[t]he United States has a universally unquestioned superiority in this field . . . . From the standpoint of defense, the edge in military potential that the United States has enjoyed is due, in large part, to our application of computer technology to military weaponry." Byrd described American intelligence reports that the Soviets had been acquiring computers which can be applied to military technology, and that \$500 million worth of such equipment was acquired from the United States last year.

#### IBM AND PARTNERS PROPOSE SATELLITE BUSINESS SYSTEMS

IBM, Comsat and Aetna Insurance have proposed a \$250 million network for satellite transmission of voice and data communications, to the Federal Communications Commission (FCC). The new venture, Satellite Business Systems (SBS), would be equally owned by the three partners, thereby meeting earlier FCC restrictions on ownership (*Washington Report*, 11/75).

The network will be entirely digital, utilizing time division multiplexing. The satellites will transmit to rooftop receiving stations at or near customer sites, with ground communications (SBS or other) to points which could not support their own receivers. Access ports will be compatible with industry standards, in accord with SBS's stated policy of nondiscrimination in interconnection.

The Congressional Office of Technology Assessment (OTA) has organized an advisory panel on research and development policies, according to a recent issue of *Science & Government Report*. The panel was said to be organized in mid-1975; it was therefore not intended to overlap with the Administration's advisory groups which are planning for the new Presidential science adviser (*Washington Report*, 1/76).

The OTA panel, in contrast to the Presidential advisory groups, is largely composed of academicians, including Jerome Wiesner (president, MIT and President Kennedy's science adviser) and Donald Hornig (president, Brown University and President Johnson's science adviser). Two panel members are closely related to information processing: Lewis Branscomb (vice president and chief scientist, IBM) and Herbert Simon (Carnegie-Mellon University). Branscomb is one of the few members belonging to both the OTA group and the Presidential advisory groups; he will head a special study on applications of science and technology. The panel is funded to October, 1977 at a level of \$925 thousand.

#### NEWS BRIEFS

- The Privacy Protection Study Commission will hold hearings on February 11, 12 and 13 in New York City, on the record-keeping practices of credit card issuers and travel reservation services.
- Mr. James Howard, formerly counsel in the White House Office of Telecommunications Policy (OTP), has accepted a staff position with the EFTS Commission; he was closely associated with the Rule Report, *Value Choices in EFTS*, published by OVP.
- The Federal Communications Commission has approved an AT&T application to provide trans-oceanic Dataphone services; this market is presently served by ITT, RCA and Western Union.
- The National Bureau of Standards (NBS) has issued an index (#) of design requirements imposed on Federal government information systems by the Privacy Act of 1974 (\$3.50).
- Richard Shriver is expected to be named by President Ford as the head of the Pentagon Defense Telecommunications and Command Control Systems Directorate; he was formerly a computer-communications software consultant to the Pentagon.
- The Commerce Department's recently released *U.S. Industrial Outlook 1976* has predicted a \$12 billion increase in computer industry shipments during 1976, up 16% from 1975.
- The National Science Foundation (NSF) has released a report on technical job characteristics (#), which includes attention to "computer specialists".
- NSF has reported 1975 graduate science enrollment is up 4%.
- NBS has issued a document (#) intended to assist in the conversion of programs that are to be compiled in compliance with the revised 1974 COBOL Standard (FIPS PUB 22-1).
- The National Bureau of Standards has released its annual report for FY 75 (#), which includes a brief description of computer-related activities.
- AT&T has, as expected petitioned the FCC to reconsider its recent interconnection decision (*Washington Report*, 12/75).
- The White House Science Adviser Bill remains in the Senate, with prospects for passage in early March without some of the provisions to which the President has objected (*Washington Report*, 1/76).
- NBS has revised instructions for implementing the ASCII in Federal computer and telecommunications applications.

AFIPS IN WASHINGTONAFIPS SEEKS TO COMMUNICATE WITH PRESIDENT'S SCIENCE ADVISORY GROUP

The AFIPS Washington Activities Committee, Anthony Ralston, Robert Rector and the Director of the AFIPS Washington Office recently met with Dr. Lewis Branscomb, a member of the President's Advisory Group on Contributions of Technology to Economic Strength, to discuss national science policy issues related to information processing. The Advisory Group, in planning for the establishment of a Presidential science adviser (*Washington Report*, 12/75), is presently attempting to identify primary science policy issues.

In describing the prospective office of the science adviser, Branscomb said that the office will be more open; he further indicated that economic issues will receive higher priority than with the predecessor office (the Office of Science and Technology) and that commercial technology will receive greater attention. He also noted the particular interest shown by Dr. Simon Ramo, chairman of the Advisory Group, in the application of computer technology to increase productivity.

AFIPS COORDINATES EXPERT COMMENT ON DATA COMMUNICATIONS ASPECTS OF H.R. 214

In response to a request from Rep. Charles A. Mosher, the Washington Office coordinated expert comment on H.R. 214, a bill which in its amended form would make it illegal to intercept data communications sent over common carriers. Data communications experts from whom AFIPS requested comment were Paul Armer, Paul Baran, Martin Hellman, Donn Parker and Keith Uncapher. Comments (#) were restricted to the technological aspects of the data communications provisions in H.R. 214, and were directed primarily to the point that if the bill is intended to reach data communications generally, it should be amended from its present form (which covers only data communications over wire) to encompass satellite, microwave and other data communications technologies. During the course of developing AFIPS comment, the panel of commentators met in California with representatives of the National Bureau of Standards (NBS) and the National Security Agency (which is acting as a cryptographic consultant to NBS), to discuss the proposed NBS encryption algorithm, and its relationship to H.R. 214.

AFIPS SUBMITS PANEL OF SSN EXPERTS TO PRIVACY COMMISSION

The Washington Office recently organized a panel of experts, at the request of the Privacy Protection Study Commission (*Washington Report*, 12/75), on private sector usage of the Social Security Number. The panel was formed by soliciting nominations from each of the AFIPS society liaisons to the Washington Office, and the panel itself consists primarily of members of the AFIPS constituent societies. Other AFIPS constituents interested in participating should contact the Washington Office as soon as possible.

<p>AFIPS societies have permission to use material in the <i>AFIPS Washington Report</i> for their own publications, except that where an article title appears with an " * " clearance must first be obtained from the AFIPS Washington Office. Documents indicated by the symbol "(#)" are available on request to the AFIPS Washington Office.</p>
---

# Washington Report

90

\*\*\*\*\*  
American Federation of Information Processing Societies, Inc., Suite 420, 2100 L Street, N.W., Washington, D.C. 20037 202-296 0590

Vol. II, No. 3

March, 1976

## AFIPS WHITE HOUSE BRIEFING

On February 5, 1976, senior officials of AFIPS and its constituent societies were given a White House briefing on Federal government matters of particular relevance to the information processing community. The briefing was presented by Executive Branch spokesmen from the White House as well as from the various Federal agencies cognizant of the subject areas addressed, and was arranged through the White House Office of Public Liaison. The specific topics briefed were selected on the basis of an advance poll taken of the AFIPS attendees.

The material presented at the briefing, because of its general interest to AFIPS beyond the audience which could be accommodated in the White House Family Theater, is described at length below.

*OFFICE OF TELECOMMUNICATIONS POLICY.* John Eger, Acting Director of the White House Office of Telecommunications Policy (OTP), began the briefing by describing the mandate of his office to formulate policy on the relationship between the Government and private sectors in telecommunications. Characterizing the Federal government as a primary telecommunications user (a \$50 million capital investment, with annual expenditures of \$10 - \$15 billion), Eger raised two fundamental questions. First, when should the Federal government provide its own computer communications, and when should it rely on the private sector? While the Federal government must be careful not to overburden existing common carriers, he said, it should leave as much as possible to the private sector and not become a competitor with it. Second, what is the proper role of the Federal government in regulation of computer communications? OTP has generally been an advocate of minimal government regulation (*Washington Report*, 8/75), and is presently developing this policy in three areas: data communications, EFTS, and privacy. Eger described OTP's systematic review of regulatory legislation, and their efforts to eliminate government regulation where possible.

Roland Homet, Chief of the Studies and Analysis Section of OTP, reviewed the OTP analysis of computer communications regulatory questions now before the Federal Communications Commission (FCC). Homet noted the earlier FCC "Computer Inquiry" which distinguished between data communications and data processing, ruling that the FCC would regulate the former but not the latter; he further noted that the same fundamental distinction is now at issue in both the controversy between Telenet and Tymshare (*Washington Report*, 11/75), and the Dataspeed 40 tariff now pending before the FCC (*Washington Report*, 2/76). He went on, however, to articulate the critical issue underlying these controversies: should the provision of these services and goods, however they are characterized, be subject to government regulation at all? While it is true that the data communications and data processing technologies are becoming increasingly integrated, the most crucial question is whether the markets they address display the "natural monopoly" conditions which have traditionally been the justification for Federal economic regulation. OTP has formally taken the position that both the services of value-added carriers (e.g., Telenet), and the manufacture of terminal equipment (e.g., the Dataspeed 40) should be deregulated.

Charles Joyce (now OTP Special Assistant for National Security Activities and formerly Assistant Director for Government Communications) discussed issues relating to the Federal government as a user of computer communications, raising two primary issues. First, as the Government continues to develop networks for what have traditionally been viewed as government services (e.g., networks for biomedical communications, or scientific and technical information services), when does the Government cease providing a legitimate Federal service and begin to infringe on services which should be provided by the private sector? Second, how is the Federal government to treat privacy and security in its computer communications systems? Joyce described the primary policy factors to be balanced as the need for privacy and security in computer networks, and the competing pressure for the efficiencies to be achieved in networking and resource sharing. He cited security technology as a possible solution, but one which requires a substantial technical basis. Joyce called for assistance on this question from societies such as AFIPS, to supplement the expertise OTP presently draws from its own staff as well as that of the White House Office of Management and Budget, the National Bureau of Standards and the General Services Administration.

Tom Keller, OTP General Counsel, addressed OTP activities related to the area of privacy. In addition to describing the general Federal interest in this area (e.g., the Privacy and EFTS Commissions) he pointed out the OTP studies on current legal protections related to individual policy (by Prof. Greenawalt of Columbia University Law School) and on the social implications of EFTS (by Prof. Rule of SUNY). Keller indicated that OTP is undertaking a follow-up study on the threats to privacy which may be posed by a comprehensive EFT system. OTP is particularly concerned about information collected by the Federal government, in that such information can (in distinction to the private sector) be compelled by legal process. Keller emphasized the OTP position that private sector costs for enforcement of privacy legislation such as H.R. 1984, and private sector alternatives to Federal government privacy protections, should be fully examined before any related Federal action is taken; he specifically called for any empirical data which may be provided by AFIPS on the compliance costs of Federal privacy legislation.

In closing, Mr. Eger extended an invitation for AFIPS to continue an open dialogue with OTP, on questions of computer communications. The future of computer communications, he said, will depend heavily on actions taken by the Federal government, and these actions will in turn depend on the quality and impact of this dialogue.

**TECHNOLOGY TRANSFER IN INFORMATION PROCESSING.** Arthur Downey, Deputy Assistant Secretary of Commerce for East-West Trade, began his remarks with a description of the complex Federal regulatory structure relating to the export of computer technology. This structure is basically tripartite, with the State Department playing a role under the Mutual Security Act of 1954, the Commerce Department playing the largest role [in terms of implementation], under the Export Administration Act of 1969, and the Defense Department playing a major policy role as required by the same 1969 statute [the Pentagon has virtually a veto power over exports related to national security]. In addition, the Trade Act of 1975 has created an oversight board for monitoring the flow of technology to socialist countries, to be known as the East-West Foreign Trade Board.

Downey described "national security" controls as having the heaviest impact on the export of advanced technology to socialist countries, while adding that "foreign policy" controls may also play a role in the export of technology to specific coun-

tries (e.g., Angola). While there are several working levels of control, the highest is at the cabinet level in the Export Administration Review Board, which is comprised of the Secretaries of State and Defense, who will soon be joined by the Secretary of the Treasury as well.

While most products are exported under a "general license" (which must be obtained only once for a category of products), high technology products such as computers move under "special licenses," which must be obtained for each specific shipment. While not defining the terms specifically, Downey said that "scientific and educational technology" is allowed to transfer freely to all countries. "Industrial data" is generally allowed to move to the non-communist "free world" on the theory that the U.S. is advantaged by this flow of technology to our allies; the same technology however, when exported to communist countries, is very tightly controlled. In granting special licenses, several factors are considered: (1) the strategic or military impact of the product, (2) the end user, (3) the end use (and whether the computer system at issue is appropriately scaled to this use), and (4) the risk of diversion of the export to other users. The U.S. cooperates in this program of export control with its 13 NATO allies and Japan in a group called the Coordinating Committee (COCOM), which maintains an International Commodity List of items which are banned from export to socialist countries.

In particularly difficult or disputed applications for computer export licenses, the Commerce Department will establish a task force with other agencies to examine critical factors; they often draw upon the Institute for Computer Sciences and Technology at the National Bureau of Standards, which Downey described as a "highly respected, talented group." In addition, the Department has organized several technical advisory committees in areas such as computers and computer peripherals, to assist it in arriving at the U.S. position on export controls in the national and international contexts.

Downey noted as particularly difficult problems (1) assessing the risks in allowing export of training and software associated with computer sales, and (2) assessing the appropriateness of systems for particular applications.

While describing the present system as a workable one, Downey acknowledged the competing pressures from industry to relax export controls to a more "realistic" level, and from Congress, which is generally not sympathetic to decontrol of high technology exports.

**RESEARCH AND DEVELOPMENT IN INFORMATION PROCESSING.** The research and development (R&D) area was addressed in presentations from the two largest funding organizations of computer R&D in the Federal government, the National Science Foundation (NSF) which has a proposed budget of \$15.8 million in fiscal year 1977 (FY 77) and the Defense Advanced Research Projects Agency (ARPA) which has a proposed FY 77 budget of \$37.7 million.

**NSF.** Dr. John Pasta, Director of the Division of Mathematical and Computer Sciences in NSF, described the agency's computer science budget for FY 77 in the context of the overall R&D budget proposed by President Ford (similar figures have been described in the February *Washington Report*). Pasta noted that overall R&D has declined about 30% (in 1967 dollars) from 1967 to 1975, but that research alone had remained about constant. In the proposed FY 77 budget, however, computer research funding is up 26% over FY 76 [an increase on the order of 15% over FY 76, even considering inflation].



Pasta pointed out that NSF and ARPA will remain, under the proposed FY 77 budget, the primary contributors of Federal support for research in computer science at universities and colleges. The specific amounts are (in \$ millions):

	<u>Actual FY 75</u>	<u>Estimated FY 76</u>	<u>Estimated FY 77</u>
NSF	8.3	9.8	13.9
ARPA	13.4	12.0	14.2

Pasta also described in detail the allocation of R&D funds within the Computer Science Section in NSF for FY 77 (in \$ millions):

<u>Program Title</u>	<u>Actual FY 75</u>	<u>Estimated FY 76</u>	<u>Estimated FY 77</u>
Theoretical Computer Science	2.13	2.35	2.65
Software and Programming Systems	2.68	2.75	3.15
Computer Systems Design	1.69	1.84	2.00
Networking for Science	0.63	0.80	0.80
Techniques and Systems	2.35	2.10	2.10
Software Quality Research	0.94	1.30	2.50
Special Projects	<u>1.36</u>	<u>1.40</u>	<u>2.60</u>
Section Total	11.78	12.54	15.80

ARPA. Col. David Russell, Director of the Information Processing Techniques Office (IPTO) in the Department of Defense Advanced Research Projects Agency (ARPA) outlined the general operations and specific program of his office. He described the charter of ARPA to be working at the forefront of emerging technology, and he emphasized that ARPA is involved only in basic and exploratory research oriented toward the missions of the Department of Defense. ARPA endeavors to avoid research areas being addressed by industry, and will withdraw from a research area if it appears that the problem will be solved through industrial research.

Russell gave the following outline for proposed IPTO research in FY 77 (the initial numbers correspond to standard Department of Defense research categories and the italicized categories are explained in greater detail below):

*6.1 Basic research in computer and communications sciences* (\$17.2 million)

6.2 Exploratory development

- *Distributed information systems* (\$11.0 million)

- *Integrated command and control, and communications systems* (\$9.5 million)

*Basic research in computer and communications sciences* (\$17.2 million). IPTO undertakes research in three areas:

*Image understanding* (\$3.0 million). IPTO is departing from traditional numerical processing of images, and moving into symbolic processing techniques adopted from the field of artificial intelligence.

*Intelligent systems* (\$8.4 million). ARPA will continue its long-standing effort in this area (it has funded approximately 75% of all artificial intelligence research). The agency will focus on three areas: (1) "basic" artificial intelligence, including problem solving, natural language processing and general reasoning, (2) command and control applications, e.g., a natural language frontend processor, and an intelligent distributed data base system, and (3) the use of intelligent terminals to help solve the man/machine interface problem.

*Advanced memory technology* (\$4.8 million). This is a new effort for ARPA beginning in FY 76, consisting of a study of hardware available to support very large ( $10^{15}$  to  $10^{21}$  bits) memories in the 1990's, such as archival beam memories, and a related study of artificial intelligence techniques useful in manipulating very large data bases, such as inference and text summarizing.

*Distributed information systems* (\$11.0 million).

*Software technology* (\$5.0 million). This research will emphasize the increasing expense, and increasing reliability problems of software.

*Speech processing* (\$4.1 million). This research represents the last year of ARPA's five-year program in computer understanding of continuous speech (presently feasible only at 100 times real time) and packet speech transmission (which would enable the ARPANET, for example, to transmit both speech and digital information).

*Network and system security* (\$1.1 million). This work will address the problems inherent in the military multilevel classification systems, both from a design and certification standpoint.

*Integrated command and control, and communications systems* (\$9.5 million). Russell cited two examples of programs:

*Packet radio*. A distributed net of miniprocessors connected by radio

links capable of transmitting data at rates from 100 to 400 Kb/sec. will be investigated.

*Internetting studies.* This program will focus on how to connect different networks through various gateway schemes and internetwork protocols, as well as how to integrate wire, radio and satellite packet networks.

*AFIPS COMMENTS.* AFIPS President Anthony Ralston closed the discussion by calling on AFIPS and its constituent societies to continue the dialogue undertaken in the briefing. This dialogue consists, he noted, not only of obtaining and disseminating information about Washington, but also of the important task of providing technological input to the Federal government where needed.

#### WASHINGTON DEVELOPMENTS

#### PRIVACY COMMISSION TOLD CREDIT CARD DATA AVAILABLE TO INVESTIGATORS

The Privacy Protection Study Commission was told in February hearings in New York that credit card companies routinely supply information about customer transactions to investigators, in some cases without a court order and without the customer's knowledge. Officials of American Express testified that the company supplied information last year in response to about 500 subpoenas (*i.e.*, court orders), to Federal agencies and private attorneys. The company had not previously notified its customers of such disclosures, although it announced that it would do so in the future, except in some felony investigations. Bank of America also testified that it releases customer records under subpoena, but that it notifies its customers as required by applicable (California) state law. Both AT&T and Hertz said that they had, in certain cases, released customer records to the Federal government *without* being compelled by subpoena.

EFTS COMMISSION HOLDS INITIAL MEETING

The EFTS Commission held its first meeting in Washington on February 6. While the Commission agreed that its primary concern would be "the broad public policy issues of EFTS" (in contrast to technical issues) the majority of the meeting was devoted to organizational matters. The most substantive aspect of the meeting was a discussion of the proposed amendments to Federal Reserve Regulation J, which would define the duties and liabilities of participants in the Federal Reserve's wire transfer and automated payment services, and the proposed rules for access to the Federal Reserve's electronic clearing, settlement and delivery services (automated clearing-houses). Both the Regulation J amendments and the interim guidelines for access (#) are subject to public comment until March 19. The Commission debated whether it should devote its resources to such interim comments on immediate issues, or whether it should work primarily toward a comprehensive report; agreement could not be reached and the matter was postponed for further discussion at the next Commission meeting (scheduled for March 12).

The Commission indicated it would fully exploit existing EFTS research (Chairman Widnall noted in particular the Arthur D. Little study funded by the National Science Foundation, "The Consequences of Electronic Funds Transfer"). The Commission staff has been directed to prepare a summary of the current status of EFTS within 60 days; the report is to "bring together the results from early research, both quantitative and qualitative, and to provide beginnings of a data base for the Commission's inquiry". Preparation of the report will draw upon government resources as well as independent organizations [such as AFIPS].

Single copies of the Arthur D. Little study may be obtained by writing to: NSF/RANN Document Center, Room 1241; 1800 G Street, N.W., Washington, D. C. 20550.

PRIVACY COMMISSION RECOMMENDATIONS ON TAX RETURN CONFIDENTIALITY

The Privacy Commission will meet in Washington on March 11 and 12, primarily to discuss the Commission's proposed recommendations on Federal tax return confidentiality. The Commission published the draft recommendations on February 13, allowing only ten working days for written public comment. The recommendations (#) would amend the Internal Revenue Code to provide that the Internal Revenue Service may disclose returns to Federal and state agencies only with prior written consent to the taxpayer, except for disclosures to the Bureau of the Census for statistical purposes, to state tax agencies (under certain restrictive conditions), to the Department of Justice (in some cases without a warrant), and to the Department of Health, Education and Welfare for use in certain welfare programs.

NEWS BRIEFS

Both the Commerce Department (Deputy Assistant Secretary Arthur Downey) and the Computer and Business Equipment Manufacturers Association differ with Sen. Byrd's statement (*Washington Report*, 2/76) that \$500 million worth of computer equipment was exported to the Soviet Union last year; Commerce estimates the figure to be about \$5 million, while CBEMA puts it at \$3.5 million.

The Federal Communications Commission (FCC) Common Carrier Bureau has ordered AT&T to delay implementation of its Dataspeed 40 tariff (*Washington Report*, 2/76) until March 3, while the Commission further explores the issues involved.

The Office of the Federal Register has published an index to Privacy Act publications appearing in the Federal Register (*i.e.*, rules, proposed rules and notices) through January, 1976. (#).

The FCC, after reviewing requests from AT&T and other common carriers to reverse its interconnection ruling (*Washington Report*, 12/75) has declined to do so. Jerome Weisner, President of MIT, has been elected as chairman of the Advisory Council of the Congressional Office of Technology Assessment.

#### AFIPS IN WASHINGTON

##### AFIPS INVITED TO STATE DEPARTMENT MEETING ON IBI

The Director of the AFIPS Washington Office was invited in February to a State Department meeting which discussed the activities of the Intergovernmental Bureau for Informatics (IBI). IBI is an international organization formed under the auspices of UNESCO (United Nations Educational, Scientific and Cultural Organization), which promotes informatics as "the totality of disciplines and technologies for the systematic handling of . . . information." Its goals include the adoption of national and international policies for informatics, and the application of informatics to administration and education. IBI is funded by its members (only government representatives may be voting members) and has devoted most of its recent attention to informatics in developing countries.

The meeting focused on two areas: (1) whether the U.S. should participate as a member of IBI, and (2) whether the U.S. should participate in, and perhaps support, the upcoming IBI conference to be held in 1977 in Algeria. While no AFIPS position was expressed at the meeting, the matter is being further considered with the AFIPS International Relations Committee.

##### AFIPS MEETS WITH CONTU TO DISCUSS SOFTWARE COPYRIGHT

A meeting was recently held at the AFIPS Washington Office with representatives of the National Commission on New Technological Uses of Copyrighted Works (CONTU), to discuss input which AFIPS might provide to the Commission on copyright matters related to information processing. Specifically, the Commission is preliminarily exploring (1) the copyright of data bases, (2) the use of copyrighted materials in automated systems, and (3) the copyright of software. The Commission's staff is putting together an initial report on the magnitude of the software industry in the United States; it is seeking statistical information as well as the views of the professional and technical community on the need for copyright protection.

##### SEN. KENNEDY REQUESTS AFIPS COMMENT ON S. 32

The Senate recently passed its own version (S.32) of a bill to establish a White House science adviser. The bill must now go to a House-Senate conference committee to resolve differences with the House version passed earlier (*Washington Report*, 12/75), and Sen. Kennedy has asked for AFIPS comment. AFIPS had previously commented to Dr. Lewis Branscomb, in a January meeting (*Washington Report*, 2/76).

AFIPS societies have permission to use material in the *AFIPS Washington Report* for their own publications, except that where an article title appears with an "(\*)" clearance must first be obtained from the AFIPS Washington Office. Documents indicated by the symbol "(#)" are available on request to the AFIPS Washington Office.

# END

