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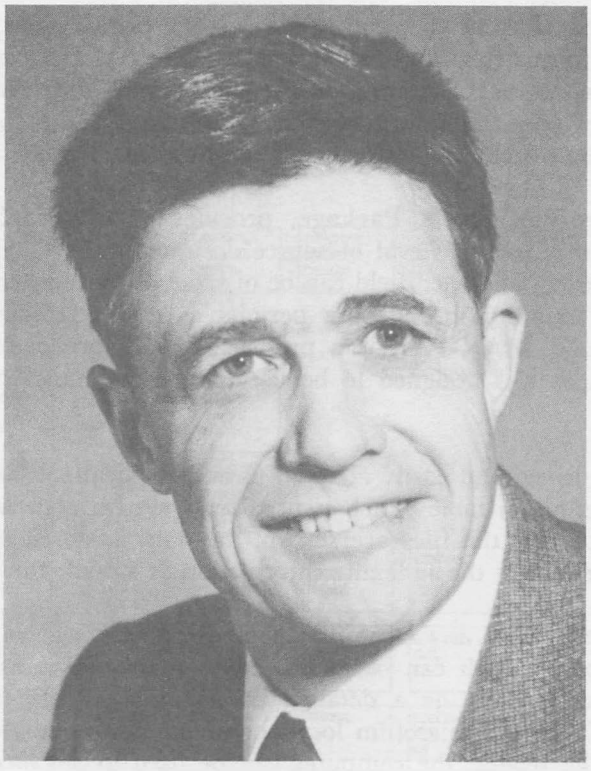

Dr. Kenneth E. Iverson

Ken Iverson has left IBM and will be moving to Toronto to join I.P. Sharp Associates. He will be working with the System Development Group primarily on extensions to the APL language.

Ken is a native of Alberta and a graduate of Queen's University in Kingston. From there he went to Harvard and studied for his Ph.D. under professor Howard Aiken. It was at Harvard that APL was conceived and it was subsequently documented in the book '**A Programming Language**' published in 1962, some two years after he joined IBM.

In his twenty years with IBM, he has seen the language grow from an idea to a full-scale commercial programming language. Many large companies, including IBM, now depend heavily on APL for their day to day operations.

Ken expects to maintain his active interest in the use of APL in teaching. Toronto in general and I.P. Sharp Associates in particular will benefit greatly from his presence, and all of us look forward to working with him for a long time.

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MAX - PAK

Bill Anderson, Rochester

A significant development in office automation is the elimination of paper as a medium for communication and information storage, and the most inexpensive alternatives to paper are the micrographic media, microfiche and microfilm. The critical part of a micrographics based file system is a fast and easy way to retrieve documents when needed, and a primary method of supporting retrieval is to have an index of key terms relating to the stored documents. The combination of micrographics with data processing is known as **C**omputer **A**ssisted Microfilm **R**etrieval, or CAR. With a CAR system, literally millions of pages of information may be stored within arm's reach of an operator, and accessed within seconds by obtaining document locations via index data in a computer.

MAX-PAK, our **Microfilm Access Package**, provides an online data base index specifically designed for microfilm storage and retrieval of source documents. Each document can be indexed by more than 500 fields, if needed, and each field can be of fixed or variable length, consisting of numeric or character data. This flexibility in indexing permits extensive cross-referencing and very rapid retrieval of stored documents. MAX-PAK is a proprietary software package that runs on all Data General minicomputers, and it is designed to be used with Eastman Kodak IMT-150 microimage terminals.

The data base is table driven and easily adapted to any application. The pertinent indexing fields are defined in a system definition table which is used by a system generation program to set up the indexing, or inverted files. Once the files are set up, the data is stored on a master (serial) file as well as in the inverted files; after the indexing information is stored, the data base is ready for use.

Documents can be searched by any combination of the index field values using AND, OR, and NOT logic. The results of a search can be examined in many ways: as the number of documents found satisfying the search profile, as a detailed presentation of the index information for each document found, or as a list of the microfilm locations of the documents found. In addition, once the microfilm is loaded into the reader, the computer can be used to advance the film to the requested document images.

A significant point is that **with a careful selection of index fields, in many applications it is often possible to get the desired information from the data base directly, without ever viewing the microfilmed document. The savings in file searching time is significant.** In view of the extensive cross-referencing capability, search profiles are easily tailored for specific retrieval requests.

While the emphasis here has been placed on the use of MAX-PAK in combination with microfilm as a mass storage medium, the software itself is applicable to any application in which the timely retrieval of data, based on certain key values or combinations of different key values, is important. A wide variety of applications such as order-entry, check processing, personnel, insurance, deed recording, production control, loan files, correspondence, law enforcement reports, and any area of document control can be implemented with little or no software modifications. Other information retrieval applications can be implemented with varying degrees of software tailoring to meet the particular needs of the customer.

Currently MAX-PAK is sold and supported only in North America. The practicability of support for MAX-PAK in Europe and other places is under discussion, but no decisions have been reached. Additional information on MAX-PAK may be obtained from:

MAX-PAK, I.P. Sharp Assoc. Inc., 1200 First Federal Plaza, Rochester, NY 14614

AIR TRANSPORTATION STUDIES AND APPLICATIONS SEMINAR

Peggy Kueffer, Washington D.C.

On October 11th and 12th I.P. Sharp Associates hosted an Air Transportation Studies and Applications seminar at the Balboa Bay Club in Newport Beach, California. Over 130 people attended representing government agencies, airlines, manufacturers, consultants, financial analysts, publishing firms, airports and universities. Attendees represented United States, Canadian, Mexican, South American and European organizations. There was an outstanding group of speakers presenting studies and applications during every session of the seminar. Each speaker's presentation is briefly summarized under the appropriate session topic below:

EFFECTS OF DEREGULATION

Thomas Miles, Vice President Marketing, Aspen Airways

The effects of subsidy on competitive local carrier markets were presented, elaborating on the Gunnison-Denver market where Aspen Airways is currently competing with Frontier Airlines, a subsidized carrier. Mr. Miles stated, "We estimate that at a bare minimum, Frontier is receiving approximately $1,838.00 from Uncle Sam **every-day-of-the-year** it provides service between Gunnison and Denver. Aspen intends to remain in the market until the Board decides whether Frontier should continue to receive subsidy when Aspen is willing to serve the market **without subsidy** while operating the same basic aircraft (Convair 580)."

James Gansle, U.S. Department of Transportation

Several charts were presented using the public Service Segment-ER586 and T6 Charter information to illustrate the effects of discount fares on domestic airline performance. The different analyses Mr. Gansle performed concluded that "The discount fares have most probably been a major factor in the improving financial picture of the airlines."

Jack Stelzer, Staff Vice President Economic Planning, Texas International Airlines

The effects of fuel costs and spiralling inflation on the air transportation industry today were discussed. Several plots were displayed to illustrate the rising costs in jet fuel. He stated, "Just six years ago, aviation jet fuel was available for 9 cents per gallon. Today contract prices are ranging between 50 and 60 cents, with spot prices as high as $1.50. If historic trends continue with 30-40% price increase per year, $4-5 per gallon jet fuel by mid 1980's is not unreasonable."

APPLICATIONS WITH INTERNATIONAL AVIATION INFORMATION

Huey-Shin Yuan, Research Assistant, University of California-Berkeley

Cost forecasting and data problems relating to the demand and supply of international air transportation were presented by Ms. Yuan. She described the background, data availability and results of the cost and traffic demand models that were developed by the university during the past two years. "The items that can be forecasted are traffic-demand, cost-capacity, freight-revenue and indicators of profitability, such as breakeven loadfactor and operating ratio."

Susan Kramer, Regulatory Planning, Pan American World Airways

The system used at Pan Am to access the Sharp Aviation Data Bases was explained by Ms. Kramer. Pan Am's Planning, Scheduling and Finance Departments use the organized system Ms. Kramer developed, which includes a library of numerous "canned" reports, instructions and definitions necessary to retrieve useful information from the Sharp Aviation Data Bases. "As a result of the system, everyone working in these departments at Pan Am has been able to produce studies in 1/5 the time it took them before they were users of SHARP."

Kelly Frey, Consultant, University of Tennessee

In performing an extensive market analysis of a proposed passenger network centered at Midway Airport in Chicago, Mr. Frey used three classes of historical airline passenger information (Official Airline Guide, Service Segment-ER586 and Origin and Destination) from the Sharp Aviation Data Bases. He described the different uses of each data base and concluded by stating, "The analysis must include either a definition of the scenario for which the analysis was performed or a very precise definition of the data used in the analysis."

SHARP AVIATION DATA BASES AND APL APPLICATIONS

David Keith, Aviation Data Base Manager, I.P. Sharp Associates, Toronto

Mr. Keith summarized the past developments of SHARP with respect to the Sharp Aviation Data Bases, bringing everyone up-to-date on new MAGIC features, data bases, plotting capabilities and documentation. He questioned the future direction of SHARP in aviation and stated that "Part of the answer depends on the impact of deregulation on the CAB's data collection system. The best solution appears to be the transfer of mandatory filing requirements from CAB to another government agency, probably the DOT. But as yet, we have no evidence that this will occur." SHARP is currently investigating establishing several data bases on the time-sharing system that do not fall under the CAB's jurisdiction. Two of these data bases are the ICAO Data Base, and Standard and Poor's COMPUSTAT. He also indicated SHARP will add CAB Origin and Destination Table 10 to the Aviation Data Base early in 1980.

Bob Dabrowski, OAG Project Manager, I.P. Sharp Associates, Toronto

The Sharp Official Airline Guide Data Base has been available for one year now and "has been one data base with the most activity..... The first of two programs that have been written to access the OAG information analyzes schedule data in a 'time of day' fashion, whereas the second is more interested in market or itinerary summaries." Illustrations were shown of the different OAG applications that are currently being used by airports, consultants and airlines. The future plans for the OAG Data Base are: devising a comprehensive seats configuration, better accuracy in latitude and longitude values and extending three months forward so that on January 1, 1980 for example, the schedules will be available up to March 31, 1980 for the Worldwide Passenger Edition.

Ettie Ettinger, Branch Manager, I.P. Sharp Associates, Newport Beach and **Joey Tuttle, Corporate Staff, I.P. Sharp Associates, Palo Alto**

APL in airline operations was illustrated by describing its uses in maintaining and printing daily market reports, monthly passenger counts by station, onboard air traffic, origin and destination traffic and schedule effectiveness. These reports were developed and are in use by Air California. Another APL system was presented which is also used at Air California, a crew scheduling decision support system. Future plans include "the development of an interactive crew tracking and operation data collection system which will allow closing the loop back to the market analysis and schedule planning steps. The system intends to provide a collection of computerized tools for the end users (schedulers, dispatchers, and planners, as well as management)."

ECONOMIC AND STATISTICAL STUDIES

John Kopecky, Regional Manager, Airlines Operations Analysis, Pratt and Whitney Aircraft Group

The computer system developed by the Airline Operations Analysis group, which extracts information from the Sharp Aviation Data Bases was described. The system portrays the "operational health of the U.S. Trunk Airlines relative to the industry as a whole and the airlines' own past performance". Mr. Kopecky gave a description of the calculated and displayed data acquisition, indicators and an interpretation of the trends which surfaced.

James A. Pickett, Senior Vice President Marketing/Corporate Planning, Air Midwest, Inc.

Mr. Pickett discussed planning techniques for new equipment, facilities, markets and personnel, which are currently used by Air Midwest, a Regional Air Carrier. He also generalized future planning requirements for this new segment of air transportation (Regional Air Carrier), which is defined by the CAB today as the top 30-40 commuters in the U.S. "Over the next five years that 150-250 mile stage length being flown by a large jet aircraft will truly be a 'rare breed of cat'. To prove this, all one

has to do is look at the block hours, fuel specifics associated with these aircraft and the fare yields on these segments."

David R. Dearth, Associate, Landrum and Brown Aviation Consultants

The Landrum and Brown airport planning process was presented by illustrating various computer-based analytical models which depict the ultimate development of an airport and provides guidelines for the development of future facilities. Mr. Dearth states, "The elements used in the planning process generally include the following: Forecast of Demand, Analysis of Demand and Capacity, Determination of Facility Requirements, Development of Alternative Plans, Evaluation of Alternative Plans, Analysis of Environmental Impact and Financial Feasibility."

Judith Driver, Market Research Officer, Rolls Royce, Inc.

A summary of Rolls Royce's semi-annual study of the U.S. Trunk Airlines short-term financial forecast was described. Of the numerous results Ms. Driver reported, one was especially surprising; "1978 annual average salary for U.S. airlines was approximately $30,000, and all private industry annual average salary was approximately $12,500."

AIR CARGO STUDIES

Adrian Wijeyewickrema, Marketing Analyst, de Havilland Aircraft of Canada

Mr. Wijeyewickrema presented a study he had performed using the Sharp OAG Data Base to determine the capacity requirements for the top 20 U.S. Cargo Commuter Airlines. Several charts and histograms were displayed to show payloads by segments, distances flown, flight frequencies and equipment types at different time intervals. "All functions necessary for this study could be made available through the Sharp Public Library if there is sufficient interest. All the user will have to do is supply the payload-range parameters for the aircraft types under study. Subsequent to this study the program was modified so that it could take advantage of seats for any aircraft used by a given carrier. Thus, by selecting PASSENGER or CARGO modes, one could effectively study the capacity requirements of any carrier in the OAG."

Fred Macey, Market Research Associate, Lockheed Georgia Company

The main point of Mr. Macey's presentation was to "illustrate how the Service Segment-ER586 information, accessed thru the Sharp Aviation Data Base, has been invaluable to Lockheed Georgia Company in understanding all-cargo operations of the trunk carriers." As a result of his numerous studies using ER586 information, he concluded "All-cargo operations have become more desirable for the trunk carriers through much improved profitability; have become increasingly feasible through improved freighter aircraft providing night-time service where there is a deficiency of belly capacity; and necessary to increase a carrier's market share and/or enable substantial growth in the total air cargo market."

Hal Adams, Market Research Analyst, Senior, Lockheed Georgia Company

Mr. Adams presented a study he had completed determining a market analysis of the potential markets for a Regional Freighter Aircraft (RFA). "The study is based on the judgement that U.S., Canada, Asia/Australasia, Latin America and Europe are the prime markets for commercial air cargo transports." Over 60 carriers were surveyed on "air cargo subjects ranging from objective questions on growth rates to subjective questions on market variables." Mr. Adams reported the RFA requirements for these markets for 1979 to 1981 and the potential growth in 1995.

I.P. Sharp seminars have been very useful not only to the Sharp Aviation Data Base users, but to numerous other members of the Air Transportation Industry. We thank all of those who participated in and attended our 1979 seminar and hope to see all of you again in 1980.

The seminar proceedings may be ordered through your local I.P. Sharp branch office.

SYSTEM REVIEW 3 - USAGE CONTROL

Many SHARP APL time-sharing users are concerned with monitoring their usage and with monitoring the security and integrity of their systems and data. For some user groups, a central person, or time-sharing coordinator, has overall responsibility.

A primary function of many time-sharing coordinators is the collection and verification of usage information. The coordinator must often recognize and respond to variations that indicate budget overruns. Gross alterations of normal usage patterns can cause concern. An analysis of expenses can help select a system for reprogramming.

The SHARP APL system provides extensive details of usage. Every day, for each user number, it provides current resource usage totals. These are the items which comprise regular monthly invoices, so they allow an accurate estimation of costs. These records are called USAGE records. The SHARP APL system also makes OFFHIST records available. There is one of these records for each user session. The record contains the sign-off time, session duration, CPU units used, and total I/O characters used. The records also have monthly totals at the termination of each session.

A time-sharing coordinator can access this information for the relevant group of user numbers. Requests for access should go to the local IPSA branch office. With no special permission, each user may access this information for him or herself only.

Regular examination of USAGE and OFFHIST can give evidence of unauthorized sign-on, excessive amounts of storage used, and other problems. They are very useful in housekeeping functions, which we sometimes ignore in computing systems. IPSA maintains these records on-line for the current month to date, and for the previous three months.

PERFORMANCE MONITORING

Many systems process similar amounts of similar data in similar ways on a regular basis. With such systems, a user expects similar resource usage and costs. When this is not so, the time-sharing coordinator looks for the reasons.

Benchmark tests can help ensure that the data centre does use consistent amounts of resources in such situations. Such benchmark tests involve running an identical program with identical data at different points in time. It is critical, of course, that these be absolutely identical. This has proven difficult in practise.

Some customers have set aside a copy of a production system, both data and programs, to serve as a reference benchmark. Such a benchmark, or a series of them, can be very useful. They do not suffer from items sometimes present in benchmarks, which exaggerate some minor deficiency or efficiency in a system's performance — but fail to give a true feeling of the system's performance a real application would experience.

IPSA makes changes to the SHARP APL system to improve it. We make some changes specifically to improve performance. Investigations of customer performance reports have helped us uncover and remove some system inefficiencies. In many instances we have helped a customer rework a system to vastly improve its performance.

System performance also includes apparent speed, or lack of it. If we press a terminal's carriage return to enter a blank line, we expect a prompt response. We feel disturbed if the response takes seven seconds, but all right with three. If an application system usually completes its work in ten minutes, we feel distressed at a failure to complete in twenty. We may even interrupt the system at some point to verify that the work is proceeding properly.

Variations in system responsiveness are inevitable. Changes from the ordinary are often frustrating. We have rejected the suggestion of artificially deteriorating some response times to avoid excessive expectations. We do, however, recognize that this is a real problem.

We appreciate reports of specific delays or performance problems which users encounter. A time-sharing coordinator serves a very useful purpose in consolidating problem incidents from a user group. In many instances, we report back to the coordinator about specific occurrences.

From time to time, due to the failure of one portion of hardware or software, SHARP APL performs in a crippled performance mode. For example, the failure of a disk controller on a heavily loaded system makes it very sluggish. In most cases of this sort, the failure and delay are temporary, and we correct them before the next workday.

Other performance problems relate closely to general system capabilities, and take much longer to alleviate. In these cases, our own monitoring tools usually define the problem quite early. By the time of user frustration, we tend to have a solution underway. These solutions, however, often require considerable time, since they can involve major changes to hardware or software. We are always pleased to describe our current planning for performance improvement.

One of the most effective tools we use to control performance is control of IPSA employee usage. When SHARP APL is heavily loaded, the system gives less priority to IPSA employee users. Under very heavy loading, we completely disallow the vast portion of employee usage. This tool allows us to provide more consistent service to customers.

ON SYSTEM HARDWARE

For the most part, the hardware in the data centre, and the communication hardware, is not important to SHARP APL users. Our system does not require user job control language statements, for example. On the contrary, users connect directly to SHARP APL and cannot access the operating system or job control. By isolating users from it, we also isolate them from its problems and security weaknesses.

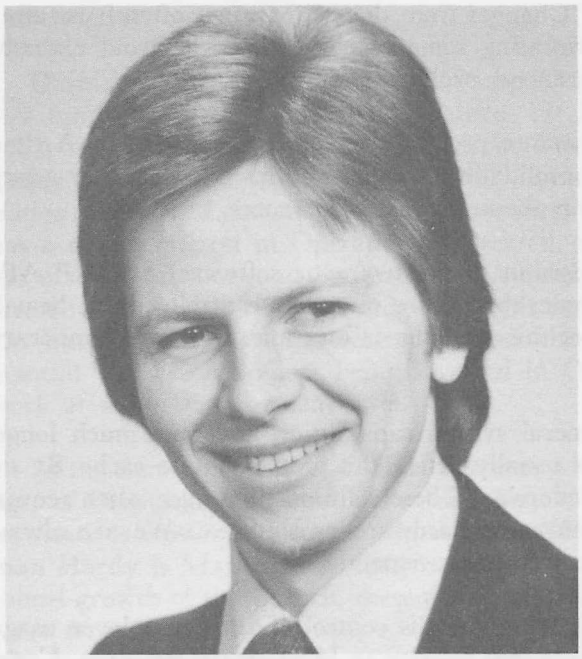
The hardware users do care about is their local terminal equipment. We have experience with this equipment, and we are pleased to share our expertise. We often can answer questions about local availability and service, and in an emergency can often arrange to provide you with a terminal temporarily.

The hardware in the data centre changes with time. You can obtain a recent summary of this equipment from your local IPSA branch. If you wish, you may visit the data centre. We enjoy meeting with customer representatives and appreciate the opportunity to exchange views and understand each other better.

SHARP PEOPLE

STOCKHOLM

Theo Sahlberg



NYTT PÅ STOCKHOLMS KONTORET

Hal Carim

Theo Sahlsberg joined our Stockholm office on January 1. Theo is a graduate (civilekonom) from the Stockholm School of Economics (Handelshögskolan) where he has also taught managerial economics (kostnads/ intäktsanalys) and behavioural science (beteendevetenskap).

Theo, who comes to us from Modulföretagen, has worked as a consultant to industry for the last five years, teaching, demonstrating, exhorting, and developing APL systems and system simulations (systemskisser) on a wide range of computers. He also teaches APL and is involved in a conceptual data base design project at Stockholm University.

Yokohama 1960: Theo's first contact with APL probably rivals Ken Iverson's...

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MICRO MEASURES MULTIPLE MACROS

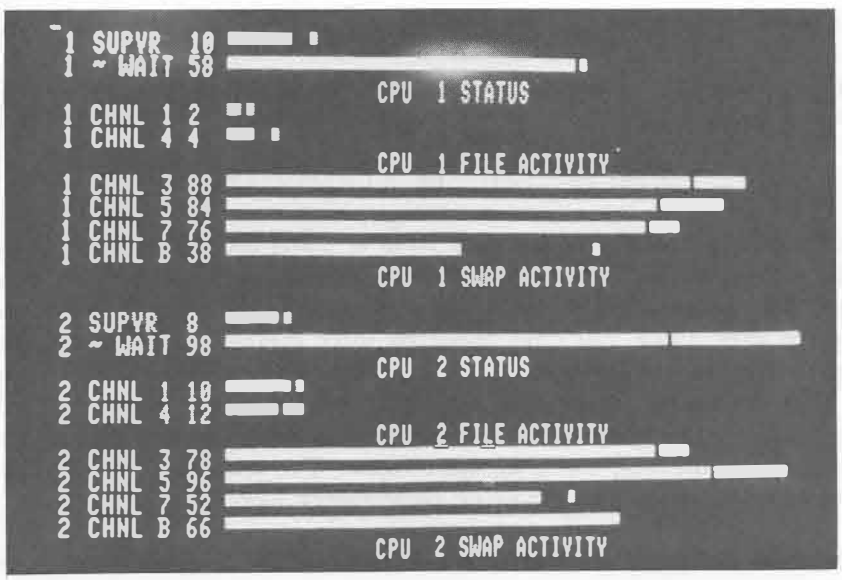
We are now using a microprocessor to monitor the performance of the Toronto APL system Amdahl 470/V6-II's. The $1500 microcomputer consists of an Exidy Sorcerer (containing a ZILOG Z80 CPU), and a Hitachi TV monitor. It is connected to both Amdahl computers, allowing realtime simultaneous measurement of channel and CPU utilization. Sampling hardware was constructed by Rick Lazlo (ACE), our Amdahl engineer, and the rather simple programs used in the Z80 were written by Bob Bernecky (RBE).

Previously, simultaneous measurement of two processors required significant hardware resources, as well as substantial planning. The new monitor will give the SHARP APL Operations staff an instantaneous indication of the demands that the APL users are placing on the hardware, and this will assist us in making decisions about when to acquire additional hardware, and will also provide almost immediate detection of certain hardware malfunctions.

It is also expected to help the APL Development Group analyze the performance of SHARP APL running under the various operating systems (DOS, VM/DOS, MVT, MVS, DOS/VS) used by in-house SHARP APL customers.

It is interesting to note that the Z80 is approximately as fast at bit manipulation as a 360/50, the first machine used at I.P. Sharp Associates for APL time-sharing. The Z80 fits in a breadbox. The 360/50 fits in a bakery.

The monitor in place on the bridge



BRANCHING IN SHARP APL, PART III

Robert Metzger, Rochester

One of the purposes of branching is for creating loops. Loops built with branches are often unnecessary in APL. In previous articles, we have seen that branching for alternative logic can be avoided with several methods:

1) Boolean conditional statements,
2) Compression,
3) The execute function.

This article suggests another way to avoid branching, particularly iterative structures built with branches.

USE APL'S BUILT IN LOOPS.

The loops which are built into the APL's primitive functions and operators let you process arrays without having to write loops with branches. In fact, if a process takes all of its input data from arrays in the active WS, and places all of its output in arrays in the active WS, you can almost always describe that process with a set of APL statements which do not use branching. You want to take as much advantage of APL's built in looping as you can, because loops which process arrays are usually more expensive, probably harder to understand, and certainly more prone to errors.

In order to make use of APL's built in loops, we must make use of APL's array processing capabilities. How familar are you with arrays of rank greater than 2? Many APL users never progress beyond matrices. Their programs often include loops which could have been eliminated by using cubes or arrays of higher rank. They live in a computational Flatland.

How can you become familiar with such arrays? Build yourself a cube of numbers, such as

```
CUBE←(100×⍳3)∘.+(10×⍳4)∘.+1×⍳5
```

Notice that the values in this cube give you a clue to where they came from. The digit in the 100's place will be the sheet (page) number, the digit in the 10's place will be in the row number, and the digit in the 1's place will be the column number.

Become thoroughly acquainted with indexing such a cube. Try examples until you can correctly predict the shape and value of indexing the cube across any combination of the dimensions, such as

```
CUBE[;4 3;2]    or    CUBE[2;;3]
```

Having mastered indexing, you should try your hand at using those functions and operators which are modified by the axis operator. These are compression, expansion, catenation, rotation, reversal, reduction, and scan. Become comfortable with applying such functions and operators to your cube along each of its three axes. Once you have mastered three dimensions, you can leave your fellow mortals behind and move into four!

Once you have become comfortable with the structure of multi-dimensional arrays, you need to learn to think in terms of processing entire arrays at once. The following practical example demonstrates how array-oriented thinking can eliminate unnecessary looping.

Given a vector with M elements, and a matrix with M rows and N columns, multiply each column of the matrix by the vector.

APL does not provide a function to do this. It could be solved with a loop by the following function.

```
     ∇RES←MAT MULT VEC;CTR;LIMIT
[1]  CTR←0
[2]  LIMIT←¯1↑⍴MAT
[3]  RES←((1↑⍴MAT),0)⍴0
[4]  LOOP:CTR←CTR+1
[5]  →(LIMIT<CTR)/END
[6]  RES←RES,MAT[;CTR]×VEC
[7]  →LOOP
[8]  END:∇
```

Let's back up a moment and try another way. Many people find thinking in terms of rows easier than thinking in terms of columns. Let's try coming up with an array solution to the similar problem of multiplying a vector times the rows of a matrix.

Let

```
MAT←3 4⍴⍳12
VEC←0.7 1.3 0.4 0.55
```

We can repeat the vector to be the same shape as the matrix using the reshape function.

```
(⍴MAT)⍴VEC gives us
0.7 1.3 0.4 0.55
0.7 1.3 0.4 0.55
0.7 1.3 0.4 0.55
```

Now all we have to do is

```
RES←MAT×(⍴MAT)⍴VEC
```

All this is nice, but reshape does not replicate its argument down columns. This is part of what we mean when we say that APL stores data in row major order. We can, however, try to treat columns as rows, and see where we get.

Let

```
MAT←3 4⍴⍳12
VEC←0.7 1.3 0.4
```

Notice that we must use a vector which has the same number of elements as the matrix has rows.

```
(⌽⍴MAT)⍴VEC    gives us

0.7 1.3 0.4
0.7 1.3 0.4
0.7 1.3 0.4
0.7 1.3 0.4
```

All of the elements are repeated the correct number of times for column multiplication, but the axes are reversed. If we now use transpose (which reverses axes), we get the right multiplier matrix.

```
⍉(⌽⍴MAT)⍴VEC gives us

0.7 0.7 0.7 0.7
1.3 1.3 1.3 1.3
0.4 0.4 0.4 0.4
```

and our final solution is

```
MAT×⍉(⍴MAT)⍴VEC
```

which reduces the eight lines of the MULT function into a single statement.

You can think in terms of arrays of data. Most computers, however, can only process a single piece of information at a time (though they work very quickly). Why not write programs the way **you** think, and let APL do the looping through your arrays.

REPLICATION

Bob Bernecky, Toronto

The APL **compress** function produces 0 or 1 copies of each subarray of the right argument, controlled by the value of the corresponding element of the left argument. SHARP APL recently extended the domain of the left argument to include positive integers. This results in the "**replicate**" function, which allows creation of an arbitrary number of copies of each subarray. For example,

```
      ,1 0 2/[⎕IO]3 10⍴'   A ROSE J JOPLIN  IS A ROSE '
 A ROSE IS A ROSE IS A ROSE
```

Replicate provides a simple and efficient solution to several common programming problems:

Add a single column matrix *C* to each column of a matrix *M*:

```
M+⍉(⍴M)⍴C ⍝ 5 FUNCTIONS.
M+(¯1↑⍴M)⌿C ⍝ 4 FUNCTIONS.
```

A time-series might be represented as one of several forms. It may be a vector of values, at fixed time intervals:

```
TF←1 2 3 4 5 6 7 8 9 10 11 12
VF←3 3 5 6 6 6 6 3 7  7  3  5
```

It may also be represented as a vector of values, at variable time intervals, where the times denote when a value changed:

```
TV←1 3 4 8 9 11 12
VV←3 5 6 3 7  3  5
```

It is frequently necessary to convert the fixed form to the variable form for dense storage of sparse data. A function to perform this is:

```
TV←(1,1↓VF≠¯1⌽VF)/TF
VV←VF[TV]
```

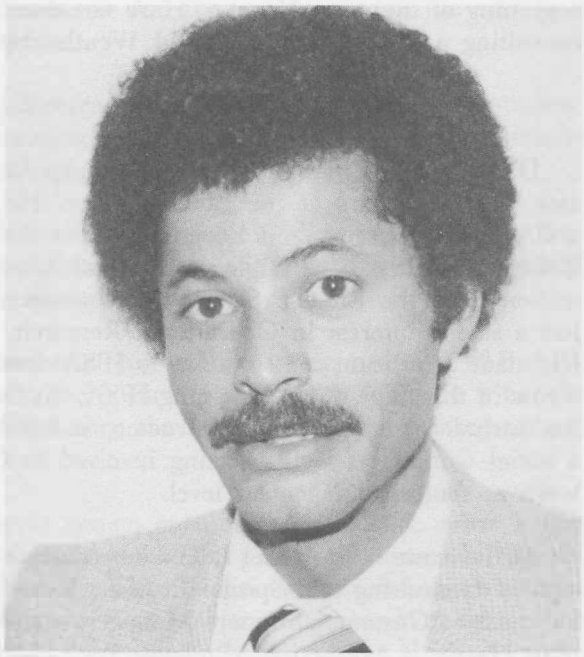
A function to convert the variable form into the fixed form is used for some plotting applications. It is simple, using replicate:

```
TF←⍳⌈/TV
VF←(1↓(TV-¯1⌽TV),1)/VV
```

Replicate is also handy for building expand masks, and for other problems which heretofore had more complex solutions, often using grade, index, or scan.

MIAMI

Ted Talbot



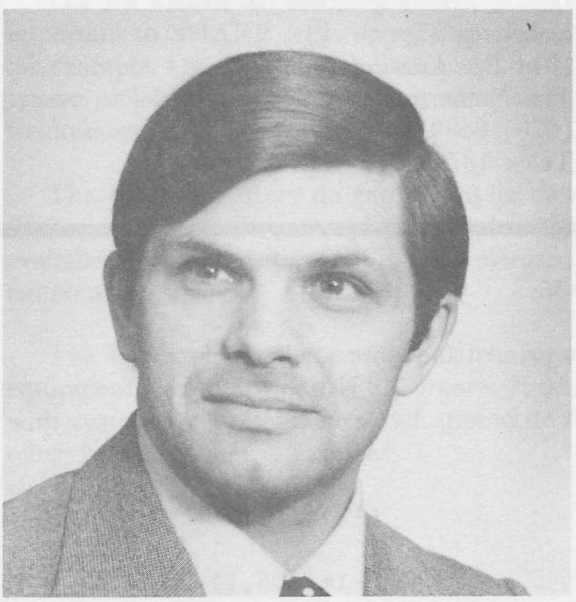
Ted Talbot is the new Branch Manager in Miami. Ted joined Sharp Toronto Sales and Support three years ago, and most recently was the Support Group Manager there. A B.Math(Honours) graduate of the University of Waterloo, he brings to Miami over 8 years experience in APL applications. Ted has been responsible for developing and implementing transaction processing and management information systems, such as equipment reservation, sales and inventory reporting, financial statement reporting, mutual funds administration, bond portfolio management, accounting, financial planning, budget consolidation, and corporate banking. "I have always enjoyed customer contact and I am looking forward to the new exposure", says Ted, "and given my enthusiasm for baseball, tennis, and windsurfing, I am sure I'll enjoy the South Florida sun also."

Joining Ted in Miami, will be **Mary Lou Tomlinson** from the Houston office. Mary Lou has two years experience as an APL consultant.

HAMILTON

A new Canadian office is being established by **Danny James** at:

Danny James



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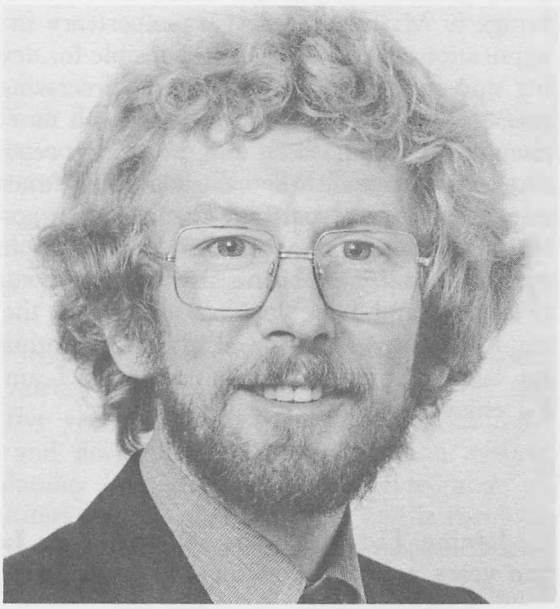
Danny joined I.P. Sharp Associates in Toronto in August 1978 from IBM Canada Ltd., where he spent three years as a financial analyst in the General Systems Group. The last year, in the General Business Group at IBM, he was involved in setting up an internal financial planning/reporting system in APL. He has a B.Math from the U. of Waterloo and an MBA and MA(Economics) from York University, and did some computer modelling for Imperial Oil and the Government of Ontario as a summer student. "I first came across APL in 1970 at Waterloo when I found it was easier to do Stats assignments in APL than Fortran."

LONDON

There have been some changes in the structure of the London Branch office, effective from the beginning of the year. Hazel O'Hare has decided that she would like to devote herself more fully to consulting activities, and so **David Weatherby** has taken over as Branch Manager.

David Weatherby



David, aged 35, has been with I.P. Sharp Associates for three years at the London office. He has a BA in Engineering and Economics from Trinity College, Oxford, and a Diploma in Social Administration from the London School of Economics. He has a strong interest in Operational Research, and has made significant contributions to IPSA developments in this field. Prior to joining IPSA, his career has included time as a ski instructor, and also as a social worker, as well as being involved in O.R. work at senior management level.

At the same time, **Hazel O'Hare** becomes Manager of Consulting and Special Projects; **Ken Chakawhata** is Customer Support Manager; and **Norman Hardy** is Marketing Manager. With the continued growth of the Branch, these divisions will be more formally separated, with a view to providing better service to all our clients.

NEW OFFICE ADDRESSES

PHILADELPHIA

Make a note of the new location for the office:
Suite 604, 437 Chestnut St.,
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AMSTERDAM

Intersystems BV moves on March 1st to:
Kabelweg 47,
1014 BA Amsterdam,
The Netherlands.
(020) 868011
Telex 18795 ITS NL

ERRATA—Apologies for the following error in Vol.7#6:

Teeson's Teaser solution (3): the 'After' column was printed too close to the 'Before'. It should read:

(3)	**Before** *I*	**After** *I*
`⎕IO←1`	`(-¯1+I)φS,(¯1+I)φV`	`(-I)φS,Iφ V`
`⎕IO←0`	`(-I)φS,Iφ V`	`(-1+I)φS,(1+I)φV`

SHARP HELPS BOAT PEOPLE

Don Howson, Ottawa

Most people have heard of the "Boat People", but not many are aware of some of the behind-the-scene activities which help to bring them into Canada.

Here in Ottawa, a team at the Employment and Immigration Commission are responsible for matching incoming refugees with the many private sponsors from across the country. With the refugees arriving at the rate of 1000 per week, this is not an easy job. Each day, the Refugee Task Force Matching Centre receives information on twenty-five to fifty new sponsors, detailing the number of refugees they are prepared to sponsor, ethnic, language, or employment requirements, and so on. Immigration officers in Hong Kong, Singapore and Bangkok send biographical and medical details of the refugees who will be arriving at the staging areas in Montreal and Edmonton about five to ten days later. The Matching Centre then has to match the refugees with sponsors, and notify the local Canadian Immigration Centre (CIC) so that they may, in turn, contact the prospective sponsors.

A manual system for filing the sponsors and refugees worked fine for a while; however, by the end of October, the volume of records required that the procedure be partially automated.

The Refugee Task Force outlined the basic requirements of a system, leaving the details to I.P. Sharp. They needed a system which would store sponsor and refugee information. It had to permit retrieval using detailed search constraints, and had to provide cross-tabulating facilities. Several standard reports and machine generated working documents were needed, and the system had to be able to compile a telex message and produce a paper tape for transmission to the staging area and the CIC offices. And one last small detail: the system had to be up and running in four days.

Some of these requirements immediately pointed us to MABRA (our record administration system) for its searching, retrieval and cross-tabulation features. Using MABRA utilities, a custom-made overlay was written. This overlay handled all the data entry, reports, telex compilation, and cross-talk between the two MABRA systems.

Work on the system started on Tuesday, October 30th and was completed on the following Friday. Then on Saturday, lead by Task Force den mother Bev St. Germain, seven members of the Recruitment and Selection Branch congregated in the Ottawa office to enter the sponsor information into the system. Fourteen hours later, breaking only once for beer and pizza, the job was finally done. At that point, the system was officially up and running, and was put into operation the following Monday morning.

Up to the end of October, some 8100 Southeast Asians were placed with private sponsors. During November and December the system was used to match another 4500 refugees. With the announcement by the federal government that all refugees must now be sponsored by private groups, the number is expected to increase by about 4000 each month until April, tapering off until Canada's quota of 50,000 refugees has been filled.

APL80

An international conference on APL, organized by the Leiden University Computer Centre, and sponsored by the Dutch Computer Society and the European Cooperation in Informatics, will be held on the 24, 25, 26 and 27 of June, 1980, in the Leeuwenhorst Congress Centre, Langelaan 3, Noordwijkerhout, near Leiden. The conference deals with all aspects of the programming language APL.

LIBRARY CHECK

Applications Libraries (public workspaces numbered from 1 to 499) are constantly being updated. This column will help you keep track of the latest adjustments.

GONE:
- 59 *AGEDAR*..... Superseded by *MABRA* and *MABRAUTIL*
- 59 *BUDGET*..... Superseded by *MABRA* and *MABRAUTIL*

NEW:
- 11 *BIBLIOGRAPHY*..... Access to a bibliography of APL literature—more than 1000 items listed. This is a MABRA system.
- 48 *SNAP*..... A Network Analysis package—for a brief description check the Sep./Oct. newsletter (7#5)

CHANGED:
- 4 *EDIT*..... A profiling facility has been added to this text-editor. Execution may start automatically, coupling 4 *EDIT* with user programs. 4 *EDIT* may be run as an N-task.
- 32 *NPE*..... Non-linear Parameter Estimation: *GAUSS* is faster, and *MARQUARDT* is more robust.
- 51 *FPPLOT*..... A new Superplot-based version that plots data from the Financial Post data bases.

READING SHARP

The following publications have just arrived from the printers — a complete list of titles appears on the publications order form available at your local Sharp office.

TECHNICAL DOCUMENTATION:

Chartered Banks Data Bases The new manual includes annual, monthly and quarterly data, with descriptions of both MAGIC and library 54 access methods (31pp).

Financial Post Data Base (revised).

Imports Data Base API reports: 'Imported crude oil and petroleum products'.

STARS User Manual A **S**torage **a**nd **R**etrieval **S**ubsystem, STARS facilitates customized modelling in APL by providing a Data Management Subsystem (entering case data, storing cases, and retrieving cases of data) that is general enough to be used in virtually any modelling system.

FACT SHEETS:

Box–Jenkins describes the Box-Jenkins forecasting technique for time series analysis.

I.P. Sharp Associates International Time-Sharing Price Schedule.

BROCHURE: **I.P. Sharp Associates** — A profile of the company.

NEWSLETTER: **Energy Newsletter** No. 2

COURSE SCHEDULE

SEMINARS and SPECIAL COURSES

Aberdeen
Appreciation of APL, February 21, April 8, June 19

Coventry
Formatting with SHARP APL, (half-day) July 12
Event Trapping, (half-day) May 10
Handling Output, (half-day) February 9
Handling Terminal Input, (half-day) January 12
N- and B-tasks, (half-day) June 14
Shared Variables, (half-day) April 12
Using SHARP APL Files, (half-day) March 8

Edmonton
User Update, January 17
Statistical Analysis in SHARP APL, March 6
MAGIC for Time Series Analysis, March 20,
Financial Analysis in SHARP APL, April 3

Gloucester
Appreciation of APL, January 14, March 3, May 12

London
Advanced APL, March 17, June 23
APL Review, January 15, Feb 18, March 24,
April 23, May 27, June 9
Appreciation of APL, January 21, Feb 26, March 21,
April 10, May 8, June 13
Linear Programming with SHARP APL, February 29
Use a Terminal, February 7, June 5

Montreal, (English and French)
AIDS, March 4, May 20
Event Trapping, February 26, April 29
Planning System Design, February 19, May 6
Plotting, January 22, March 18
Saving Money with N- and B-tasks, Feb. 5, April 22
Shared Variables, March 6, May 8
SNAP - A Network Analysis Package (half-day),
Jan. 23, April 8

Ottawa
Batch (Non-Terminal) Tasks, April 22
Box-Jenkins, June 19
Highspeed Printing, April 24
Input Validation (Idiot Proofing), April 23
MABRA, February 19
MAGIC, March 18, June 17
Plotting, February 21
Regression Analysis, March 20

Rochester
Advanced Features Workshop, (4 half-days):
Package Variables, February 7, May 8
Batch APL, February 14, May 15
Event Trapping, February 21, May 22
Shared Variables, February 28, May 29

Advanced Methods Workshop (full days):
Systems Analysis and Design, April 3
Data Structures and File Design, April 10
Program Development, Debugging and Testing, April 17
Interactive Dialogues & Report Formatting, April 24
Efficient APL Programming, May 1

Stockholm (one-day seminars in Swedish)
Saving Money via N-tasks/B-tasks/HSPrints/Error Trapping
Jan.28, Feb.25, Mar.24, Apr.21
File System & Shared Variables: Effective Design Techniques
Jan.29, Feb.26, Mar.25, Apr.22
Better Programming through Use of Software in Libraries 1-1000
Jan.30, Feb.27, Mar.26, Apr.23

Toronto
Advanced APL Coding Techniques for Actuarial Applications, Feb. 7, May 1
Advanced APL Topics, Jan. 15-17/21-24, April 8-10/14-17
(enrol for all or part of 7 sessions)
APL for Managers, Jan. 14, Feb. 25, Apr. 4, May 19, June 30
Batch Input Validation, Jan. 17, April 10
Blessings of Booleans, Jan. 22, April 15
Box-Jenkins, Jan. 10, March 6, May 8
Data Representation, Jan. 24, April 17
Data Structures/Shared Variables, Jan. 15, April 8
Debugging Techniques, Jan. 23, April 16
Event Trapping, (half-day), Jan. 16, April 9
Forecasting Methods, Jan. 11, March 7, May 9
MAGIC for Time Series Analysis, Feb. 11, April 3, June 6
Regression Analysis, Feb. 13, April 23, June 17
Report Formatting, Feb. 21, April 25, June 20
Restartability & Secure Systems, Jan. 21, April 14
Saving Money with N- and B-tasks, February 12, April 24, June 18
SUPERPLOT & MAGIC, February 15, April 11, June 16
Text Editing, February 26-27, May 15-16
The Sharp System: A Practical Approach, Jan. 17, Feb. 14, March 13,
April 10, May 8, June 5

Vienna (all courses in German)
Highlights of SHARP APL - seminar January 30
MABRA, Ein Personalinformationssystem - seminar February 13
Graphics - seminar March 13
APL I: Einfuehrung in APL fuer den Versicherungsmathematiker,
course - February 14-15
Planung - Idee und Wirklichkeit, course - March 5
Zeitreihenanalysen - Forecasting, course - March 25

Warrington
Appreciation of APL, March 13, May 30

Washington DC
Introduction to MAGIC, January 28-29
Statistics with SHARP APL, January 24
SHARP APL Enhancements (half-days) Feb. 18-19
Plotting with SHARP APL, February 26

INTRODUCTION TO APL

Aberdeen
(3 days)
March 5-7
May 21-23

Atlanta
(5 day)
March 10-14
June 16-20
September 15-29
December 8-12

Calgary
(5 day)
Jan.16,17,23,24,31

Coventry
(3 day)
January 22-24
March 18-20
May 20-22

Edmonton
(3 day)
February 5-7

Gloucester
(3 day)
February 4-6
April 28-30

London
(3 days)
January 7-9
February 12-14
March 10-12
April 15-17
May 13-15
June 16-18

Montreal
(English)
January 15-17
March 11-13
May 13-15
(French)
February 12-14
April 15-17

Ottawa
(non-programmers)
February 5-7
April 1-3
(programmers)
January 8-10
March 4-6
May 6-8

Rochester
(6 day)
Feb.25-27/Mar.3-5
April 14-16/21-23
May 12-14/19-21
June 16-18/23-25

Stockholm
(Swedish)
January 7-9
January 21-23
February 4-6
February 18-20
March 3-5
March 17-19

Toronto
(3 day)
January 7-9
January 21-23
February 4-6
February 18-20
March 3-5
March 17-19
Mar.31-Apr.2
April 14-16
April 28-30
May 12-14
May 27-29

Vancouver
(3 day)
January 23-25
February 20-22

Warrington
(3 day)
February 25-27
April 9-11
June 25-27

Washington D.C.
(half-days)
January 14-18
March 3-6

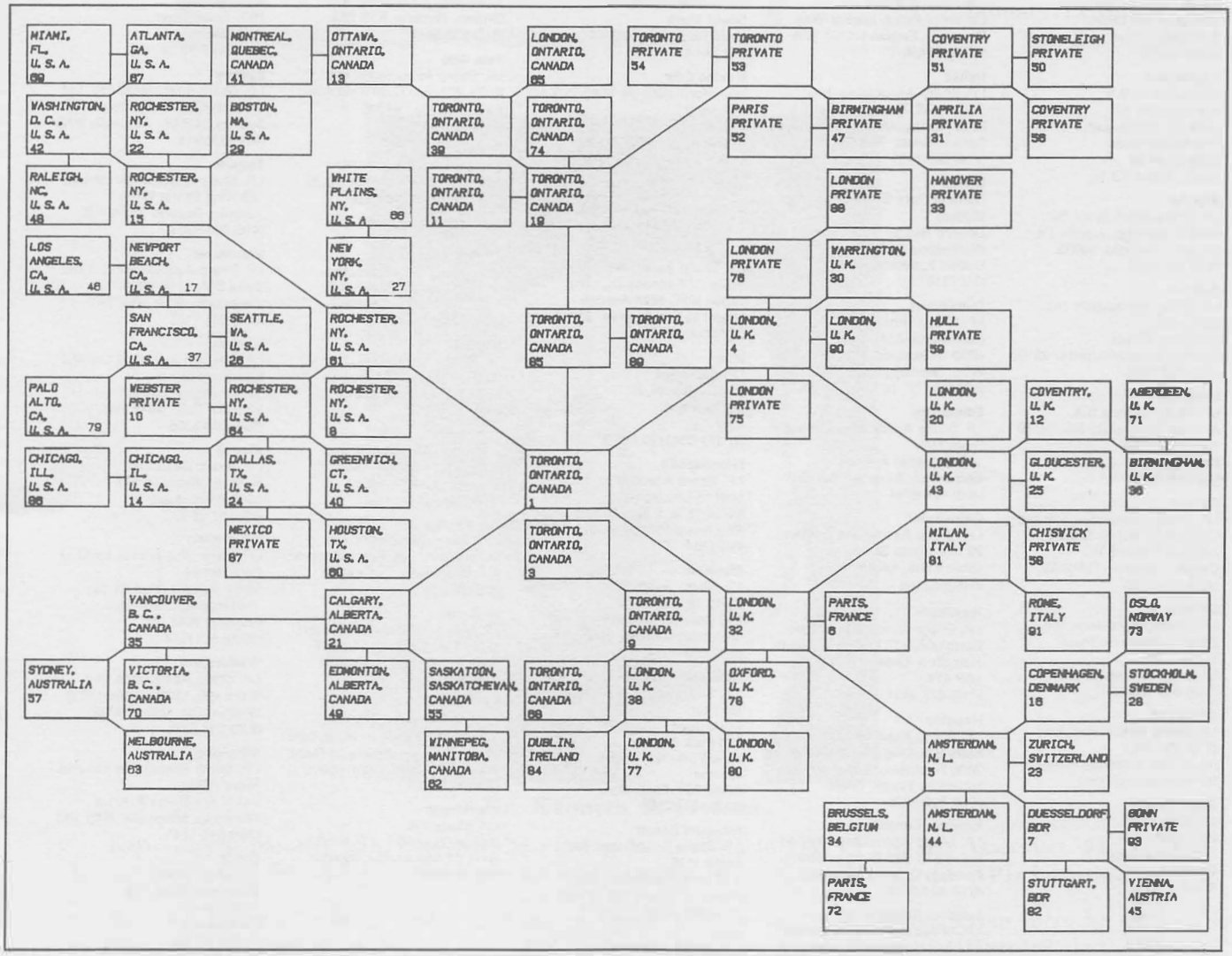
Vienna
(German)
(APL I fuer
EDV-leute)
March 26-27

Zurich
(German)
(APL Einfuehrung I)
January 14-16
February 11-13
March 10-12
(Afbaukurs/Einf 2)
January 28-31
February 25-27
March 17-19

INTERMEDIATE APL

Edmonton, February 18,19,20
London, Jan 16, Feb 19, March 25, April 24, May 28, June 10
Montreal, (English or French), Jan. 29-31, March 25-27, May 27-29
Ottawa, January 22-23, May 20-21
Rochester (4 days) March 20,21,27,28 and June 19,20,26,27
Toronto, Jan. 28-30, March 10-12, April 21-23, June 2-4
Vienna (German), APL II: February 20-22
Zurich, Jan. 28-31, Feb. 25-27, Mar. 17-19

Network Topology



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APL OPERATOR VOICE (416) 363-2051 COMMUNICATIONS (416) 363-1832

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In the United States the SHARP APL Network is interconnected with the networks of TYMNET and TELENET to provide local dial access in more than 100 other cities.

The Newsletter is a regular publication of I.P. Sharp Associates. Contributions and comments are welcome and should be addressed to: Jeanne Gershater, I.P. Sharp Newsletter, 145 King Street West, Toronto, Canada M5H 1J8.

Jeanne Gershater, *Editor* Ginger Kahn, *Assistant Editor*