UNIVERSITY OF CALIFORNIA, SAN DIEGO

9 July, 1979

Newsletter #4

UCSD Pascal^{TM} Project

Events have once again overtaken us resulting from continued rapid growth in interest throughout the industry in UCSD Pascal***. Once again we have to apologize for the long delay since our last newsletter. This time, the growth has forced major changes in the nature of the Project. As a result, this newsletter will probably be the last one distributed from UCSD to our full mailing list.

Commercial Licensing of UCSD Pascal^{TM}

Readers familiar with the recent progress of our Project will recall that our top priority objective is to promote the concept of machine independent software. To move a large and complex applications program from one machine to another, we have found it vastly more practical to move the entire software system, i.e. UCSD Pascal^{TM}, than to re-compile the applications program using just the compiler for the same high level language on each machine. The reason for this is that practical use of a programming language, no matter how well standardized, demands uses of operating system facilities. These facilities often must be reached using language constructions that fall outside the language standard specifications. Our experiences in this area have been so successful that we have felt obligated to pursue a course whereby the same UCSD Pascal^{TM} System can be made widely available on machines of many different designs.

*** NOTE: "UCSD Pascal" is a trademark of the Regents of the
    University of California. Use thereof in conjunction with any
    goods or services is authorized by specific license only, and
    any unauthorized use thereof is contrary to the laws of the
    State of California.

As a secondary objective, we are, of course, helping to promote the wider use of Pascal. Again, the objective of program portability demands language standardization. During the last year tremendous progress has been made toward international standardization of Pascal. The work is being led by a committee of the British Standards Institute, who have issued a draft for a new standard definition of Pascal. This draft describes virtually the same Pascal as described in the original Report issued by Niklaus Wirth. The new draft clears up a large number of ambiguities and inconsistencies, in Wirth's definition, making the language definition easier to understand. In the United States, a joint committee of ANSI and IEEE is actively participating in this effort. In view of the widespread use of UCSD Pascal™, we have felt obliged to support a version of Pascal which agrees with the standard language as closely as practical. In common with most other implementations of Pascal, we have made a few carefully chosen extensions to the standard language. Our "base" language does differ slightly from the new draft standard, and efforts are under way to correct these differences. We are disappointed that it seems very unlikely, in view of the real world politics of standardization, that a widely used standard will soon emerge on extensions to Pascal which are needed for some common applications.

Beginning about a year ago, these objectives led us to arrange for commercial licensing of the UCSD Pascal™ System under circumstances that would discourage advertising as "UCSD Pascal" any version of the software not functionally identical to versions issued by the Project. This required a close working relationship with many manufacturers, to assure correct installation of the System on their equipment. A substantial aggregate level of income to the Project was required to pay the student employees engaged in the installation of the System on various different equipment models. By the end of the Fall quarter we were beginning to learn how to conduct this activity reasonably efficiently.

Because of legal constraints on University of California activities, the University administration directed that the Project either cease operations or find an outside licensee to handle the routine maintenance, user support, sublicensing, and installation of the System on additional machines (as well as on all those already licensed). It soon became apparent that other legal limitations would make it impractical to use a not-for-profit outside licensee. For other reasons, well established practices of the University of California (as well as many other universities) indicated the use of just a single outside profit making firm as the University's "Sole Licensee" for support services covering UCSD Pascal™. Had several firms been licensed to handle sublicensing, under a competitive arrangement, other laws would have made it impossible for the University to compel the several firms to release and maintain the same version of the UCSD Pascal™ System. With the sole licensee, the program portability objective is optimized because the sole licensee will distribute a common version of the System for all

implementations.

In the choice of a sole licensee, many other considerations were taken into account. We felt it necessary to choose a well established software house whose business history indicated a respect and understanding for the systematic programming principles on which Pascal is founded. The firm had to be large enough, and financially strong enough, that the University could reasonably assure the user community that commercial quality support services would be available indefinitely to back commercial distributors of UCSD Pascal™. Without this assurance, many of the commercial distributors were already showing signs of creating their own software support staffs – with the inevitable result that the many distributed versions would soon differ from the University's version. (While we know there are many shortcomings in the design and implementation of UCSD Pascal™, inter-machine portability of large application programs demands that all versions be the same in spite of those shortcomings.) The firm chosen also had to be small enough to minimize the layers of bureaucracy in University communications needed to oversee the work of the sole licensee. To foster continued close working relationships with the surviving research and education components of the Project within the University, preference was given to firms willing to locate the principal support office for UCSD Pascal™ in the close vicinity of the UCSD campus.

Within these constraints, one of our major concerns was to find a firm willing to pursue the support and sublicensing of UCSD in a way that would lead to widespread availability of portions of the System to students in colleges and schools at the lowest possible prices. It must be emphasized that this objective cannot be achieved by releasing all details of the current UCSD Pascal™ System into the public domain. If there were no copyright protection and commercial publication of college textbooks, and texts were required instead to be released to the public domain, there would be no system of mass education at the college level. Similarly, widespread availability of UCSD Pascal™ to college students demands a distribution approach that in some cases will resemble textbook publishing. Moreover, the UCSD Pascal™ System will not survive as an important tool for education unless it is also used extensively for commercial computer applications in many different ways. A substantial staff is needed for support and maintenance work necessary to assure that the quality of the UCSD Pascal™ System will improve, or at least not decline, as it evolves. The sole licensee firm must therefore be able to pay that staff and make a reasonable profit.

As a result, the best we could do (for students and individual
users) was to seek a sole licensee willing to work with companies
interested in "publishing" smallish configurations of the UCSD
Pascal™System in large quanties at modest prices. Because of legal
constraints, the University is unable to specify the pricing
policies of the Sole Licensee. We sought a sole licensee willing to
price its services within the range of the many small companies who
wish to distribute UCSD Pascal™ Beyond this, the sole licensee's
pricing will depend upon feedback from the marketplace. We feel that
the interests of the small companies coincide with the University's
objective of promoting program portability via machine independent
software. Experience with the larger companies, who have so far
indicated an interest in distributing UCSD Pascal™ has been that
they usually seek licensing arrangements giving them complete
freedom to modify as they wish. Therefore, it appears that the
interests of the small distributor firms, and of individual users
in general, will be favored if the sole licensee can base a strong
and growing business on licensing arrangements which reinforce the
machine independence concept. The sole licensee can only do this by
earning a reasonable margin of profits from work with all
sublicensees, both small and large.

Given the large community now interested in UCSD Pascal™, a brief
comment on your opinions seems indicated. We understand that not all
users of UCSD Pascal™ whether individuals or organizations, are
enthusiastic about the changes described in this section. We hope
that readers will understand that we too are frustrated about some
aspects of the new licensing arrangements. The greatest frustration,
by far, results from having to satisfy the dozens of laws and
regulations that apply at the federal and State of California
levels. The new licensing and support arrangements are the result of
more than six months of negotiation, and examination of almost every
aspect of the Project and its distribution of UCSD Pascal™ The new
arrangements have been negotiated with extensive participation of
the University's central administration and legal departments. The
status of public access to the software products of the Project, and
the stated objectives for the new licensing arrangements, are the
best we have been able to achieve in making UCSD Pascal™a community
wide resource, within all the imposed constraints. We appeal to
readers to accept the new arrangements, and to assist us in taking
advantage of the machine independent aspects of the UCSD Pascal™
System, and its role in helping to make the Pascal language more
widely used.

SofTech Microsystems Inc.

The sole licensee chosen by the University is SofTech Microsystems
Inc. (abbreviated as "SMI" in parts of this newsletter). SMI is a
newly formed subsidiary of SofTech Inc, of Waltham, Massachusetts.
The principal business of SMI will be to provide support,
maintenance, sublicensing, and other services related to the UCSD

Pascal^{TM} System. They may be reached at:

Until 1 September, 1979:   After 1 September, 1979:

  SofTech Microsystems, Inc.   SofTech Microsystems, Inc.
  P.O. Box 28010   9994 Black Mountain Rd.,Bldg 3
  San Diego, California 92128   San Diego, California 92126

  Tel: (714)741-1353   (temporary)   Telephone pending

Not the least of the reasons for selection of SofTech as the sole
licensee was their extensive expertise in managing complex software
projects. As the Project began to support versions of the UCSD
Pascal^{TM}System adapted for many different processors and machines, it
became apparent that the control of all those versions to operate
identically was getting out of hand. SofTech has a major "Software
Engineering Facility" for microcomputers, called the "MSEF", which
will be used starting immediately to help bring some order out of
the chaos that has developed from the (necessarily) casual
management environment of a university project mainly staffed by
students. In addition, SofTech's management agrees with our
commitment to make the Pascal base language supported by the UCSD
Pascal^{TM}compiler conform as closely as possible to the new (draft)
international standard for Pascal. The MSEF and SofTech experience
will help considerably to complete this task expeditiously.

As this newsletter was being prepared, most of the initial staff of
SMI was just beginning to work for the firm. Roughly half of the
initial staff consists of people who, until recently, have worked
for the Project as student employees of the University. Among the
principals of the Project, Mark Overgaard has joined SMI as a full
time employee. This writer, as director of the Project, remains as a
full time employee of the University with no financial interest in
SMI, and with no employment status with them. All parties concerned
would have preferred that both Mark and this writer could have
taken split appointments, partly at SMI and partly at the
University, in order to maintain the closest possible working ties
between the Project and SMI. This has proven unworkable because of
the California Conflict of Interest Code for employees of public
institutions. Nevertheless, every possible effort is being made to
ensure that the close working relationship between the UCSD Project
and SMI will continue.

Transition to Support of UCSD Pascal^{TM} by SofTech Microsystems

After a brief transition period, SMI will henceforth be responsible
for all (sub)licensing for distribution of the UCSD Pascal^{TM}System,
or any of its components, to end users. The Project (i.e. UCSD) will
distribute copies of portions of the System under the present
catalog arrangement until the close of business on 14 August, 1979.
Orders not requiring special handling will be processed by UCSD in

the order they arrive. Any orders not yet processed by the available staff on the 14th of August will be turned over to SofTech Microsystems for whatever follow-up they consider most appropriate. Users concerned with this switch should understand that the nucleus of Project employees who have run the support group will become employees of SMI on 15 August. Thereafter, the Project will not be able to accept incoming orders, and there will be no support staff who might process such orders. Some orders for the I.5 version of the System were accepted by the University before the current catalog based distribution mechanism went into effect in January this year. Obviously, the hold-over offer of $100 credit against future catalog orders (presented to those who ordered I.5 before the catalog system went into effect) will have to expire on 14 August. We apologize about the short notice, but circumstances have made it impossible to do any better.

All existing individual licenses for use of the UCSD Pascal™ System contain a clause stating that the license holder will have unlimited rights to the licensed materials after two years, unless the University terminates the license before that time. As a result of the negotiations described in the previous section, the University is now obligated to terminate all of the existing individual licenses. We hasten to assure licensees that they will be offered a replacement for the licenses, with rights similar to those provided in the original licenses, but lacking the reversion to unlimited use after two years.

All sublicensing of distributors of portions of the UCSD Pascal™ System was transferred to SMI as of early June, 1979. It is expected that amicable arrangments will soon be made with virtually all firms who currently are licensed by the University for distribution of UCSD Pascal™ such that replacement licenses will be negotiated with SMI.

In preparation for the new licensing arrangement, the term "UCSD Pascal" has been made a legal trademark of the University of California. The sole license agreement requires SMI to certify that sublicensees, who use the term "UCSD Pascal" in advertising or describing the software they distribute, do so only when the distributed software meets specified functional tests. The tests are designed to assure that all software identified as originating from the UCSD Pascal Project will function in the same way, thus enhancing the portability of application programs. For purposes of the transition to sublicensing solely by SMI, distributors currently licensed by the University will be regarded as having passed the certification tests, but only for the version(s) of the System already licensed.

At this writing, SMI is busy preparing an announcement of services
to be offered, and pricing for those services as well as
sublicenses. Since many of SMI's employees have been hired at the
going high salary rates for system programmers, readers should not
be surprised to find that SMI's prices will generally be higher than
those previously offered by UCSD. In effect, these higher prices are
an unavoidable necessity if good quality support services are to be
available for the System on a continuing basis.

The Great Version Number Fiasco

If you order UCSD Pascal™ from a commercial distributor you may find
that it is Version I.4, I.5, II.0, II.1, or III.0. Some early
versions are based on but not identical to Versions I.3 or I.4.
We have heard of vendors selling Version III.0 as better than II.1,
and vice versa, whereas there is some truth in both claims! Herewith
a brief recounting of how this mess arose, and how it will probably
be cleaned up.

Version I.5 was first released from UCSD in the fall of 1978. It
differed from I.4 mainly by adding the facility to compile and use
independent collections of routines called "Units". This facility
makes it possible to provide a large library of service programs
written in Pascal (or Pascal mixed with Assembly Language), and to
use them without re-compilation.

During the summer and fall of 1978, the P-machine interpreter for
UCSD Pascal™ was implemented to run on several additional processors,
notably the 6502, 6800, 9900, and GA-16. It was hoped that the
interpreter for these processors could incorporate design changes to
make the P-machine generally compatible with a wider class of
processor architectures. During the same period, the Project agreed
to work with Western Digital on the development of the
microprocessor W/D is now selling as the "Pascal MicroEngine". This
microprocessor is programmed entirely in Pascal, with no machine
level or assembly language being supported. This made it necessary
to augment UCSD Pascal™ with provisions for concurrent processes, so
that interrupt routines could be written. At the same time that the
P-machine interpreter was being revised for this purpose, changes
were also made to make the P-machine more compatible with the
extended address ranges of the new generation of 16-bit
microprocessors. Because the implementation work for the 6502, 6800,
9900, and GA-16 overlapped with the revision work on the P-machine
interpreter, some of the revised P-machine features found their
way into the interpreters for those processors. Initially, it
had been hoped that the first distributed versions for these
processors could take advantage of the full set of P-machine
improvements. By the end of 1978, it became clear that this was not
feasible, since the system software to support all of the new P-
machine features would not be completed for several more months. To
reduce the chaos, we decided to establish as the single (interim)

P-machine, for all processors other than the MicroEngine, the version already implemented on the 6502, 6800, 9900, and GA-16.

The interim interpreter was designated as II.0. It was first released during February, 1979. Software for II.0 was virtually the same as Version I.5 except for corrections of reported bugs in I.5.

Version II.1 has evolved from II.0 as a way to make the System easier to use on machines with mini-floppy disk drives. Though I.5 and II.0 provide much greater flexibility than Version I.4, because of the new Units facility, the linker required to work with Units imposes a heavy overhead burden (processing time, space in memory, space on the disk). Version II.1 adds "Intrinsic" Units to the facilities of II.0. An Intrinsic Unit may be used without resort to the linker. This eliminates the need to retain a copy of the linker on one's principal working disk, and eliminates the substantial time delay associated with the linking process after every compile. (It is still necessary to use the linker to incorporate assembly language routines into a Pascal program Unit in the form of EXTERNAL procedures.) At this writing, II.1 has been released for the Apple II computer, and is being distributed by Apple Computer Inc. (not by the Project!). Work is well under way to convert all other implementations supported by the Project, apart from the W/D MicroEngine, to II.1 within the next several months. This conversion has been delayed somewhat by the shift of licensing and support to SofTech Microsystems.

Version III.0 is the initial version developed with enhancements for concurrent processing. It is the first version to be available on the Western Digital MicroEngine, which is now being delivered to customers. The Pascal language facilities of III.0 are largely those of the I.4 version of the System, and thus III.0 still lacks the Units facility of I.5, II.0 and II.1. Work is under way to augment the III.0 version to include all of the facilities of I.5, II.0 and II.1.

SofTech Microsystems will now be responsible for releasing a single new version of the System which will provide the beneficial features of all previous versions. This new version, tentatively called Version IV, will probably not be available until 1980. It is not yet clear whether an interim Version III.1 will be issued for the W/D MicroEngine, to bring the System on that machine closer to the others before Version IV is completed.

We emphasize that nothing in this summary constitutes a promise of delivery of any new version of the System. SofTech Microsystems intends to issue a description of their plans by 1 September, 1979.

User Group

There have been frequent suggestions or requests that a UCSD Pascal^{TM} user's group be established. We have been very sympathetic to this concept, but have felt it inappropriate for us to organize such a group ourselves. Moreover, it has not been possible to allocate University resources to support such a user's group.

Now SofTech Microsystems has indicated a willingness to encourage the creation of a user's group, and to supply some resources and assistance to that end. Readers interested in assisting with the formation of a user's group should write to SMI (not UCSD!).

Update on Processors and Implementations

As of this writing, implementations of current machine independent versions of the UCSD Pascal^{TM} System have been licensed for distribution on the following processors:

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  6502
  6800, 6809
* 8080, 8085, Z80
  9900
* General Automation GA-16
* PDP11, LSI-11
  Western Digital MicroEngine
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Note that the Project distributes copies to individuals only for the processors noted with "*". SofTech Microsystems will announce its own plans on individual distribution for any of the processors in this list. (Remember that their distribution starts on 15 August, 1979).

Licensed versions, though not fully compatible with those supported by the Project, are available for the following:

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  Alpha-Micro 100
  Data General NOVA
  Nanodata QM-1
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An experimental version has been implemented on the Hewlett Packard 9835 desktop computer, and another on the Lockheed Sue. Several bit-slice microprogrammed implementations have also been reported.

The Project has a version nearing completion for the 8086 processor. This activity is currently delayed for the lack of hardware on which to complete testing.

Intensive Training for UCSD Pascal^{TM}

Many people who communicate with us have asked when/whether a course would be made available on Pascal, and on the UCSD Pascal^{TM}System, for people who already can develop programs in other languages. In cooperation with Integrated Computer Systems, Inc. (the "Learning Tree" people), an intensive 4-day short course is now being developed for first offering in October this year. About half of the available time will be used for guided "hands-on" use of the UCSD Pascal^{TM}System on small microcomputers - probably Apple II's. The ICS mass mailed announcement on this course should be arriving within the next few weeks. If you don't already receive regular mailings from ICS, write to:

    Integrated Computer Systems, Inc.
    Box 5339,
    Santa Monica,
    California 90405

Future Project Plans

While all of the Project's regular services in support of the UCSD Pascal^{TM}System are being transferred to SofTech Microsystems, we expect to continue a substantial level of research and development, and education activities at UCSD. During the next year or two, we anticipate that only a small part of the financial support for these activities will come from royalties paid to the University under the sole license agreement with SofTech Microsystems. Virtually no support will come from regular University of California operating budgets. If the activity is to continue, the remaining support will have to come from other sources. The principal sources available to us are federal research grants or contracts, and grants from industrial firms under an "associates program". The potential sources for federal grants or contracts are very limited at this time, and only one small contract is expected during the next academic year.

Industrial associates programs are often the primary source of support for engineering oriented research projects at many universities. Under such a program, each of many member companies contribute each year an amount of money comparable to the cost of supporting the work of one graduate student. Several firms have already expressed an interest in joining such a program for the UCSD Pascal^{TM}Project. We have been effectively unable to move ahead on organizing the UCSD Pascal^{TM}Associates program until the licensing details described in this newsletter had been worked out. A prospectus will be sent shortly to firms known to have an interest in the Project. Inquiries would be most welcome from others. We are particularly grateful to Philips Research Laboratories, who have contributed without waiting for the organizing papers.
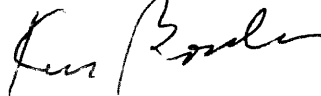
Among the distinct activities, currently ongoing in the Project at UCSD, and for which financial support is being sought, are the following:

a) Native code generation from Pascal. An experimental system is nearing completion for translating the P-code output of the UCSD Pascal™compiler into the native machine language of the host processor. The approach being taken will lead, hopefully, to the implementation of code generators for different host processors with minimal effort. The earliest test cases will be the PDP-11, the 8080 and the 6502. The plan is to allow a programmer to designate which routines (procedures and functions) in a Pascal program will be translated to execute directly in native code, rather than in the P-code of the P-machine interpreter. Programs with mixed P-code and native code are already being used extensively, with the native code being generated at present only by the Assembler associated with the host processor. Whereas the assembler approach makes a program no longer portable from machine to machine, the generation of native code from Pascal should maintain the portability while giving the execution efficiency of native code.

b) Distributed processing. During the next few months, collections of microcomputers running UCSD Pascal™will be interconnected in several different "party line" bus configurations. One method, that has been studied extensively, uses high speed serial transmission. It allocates transmission rights to the stations connected to the network according to full character slots timed within a cycle of about one second duration. Another method uses commercially available components for interconnection over an 8-bit parallel data bus similar to the IEEE 488 General Purpose Instrumentation Bus. One objective is to find an interconnection method (both software and hardware) whereby mixed microcomputers, dumb terminals, and large machines can communicate with each other within a large building complex at minimal cost. Another is to learn how best to distribute the processing resources of a collection of microcomputers, some of which will serve special functions (e.g. database access, number crunching, printer control, ...), while others will be used primarily for access to the network. In the course of this work, several concepts of a distributed operating system will be tested.

c) UCSD Pascal™Operating System improvements. The limitations of the present operating system are well known, and many ideas have been advanced on how it could be improved. Work currently going on should result in a far more general approach to handling the disk directory, in spite of the physical limitations of the typical microcomputer on which the System runs. Beyond this, there are several possibilities for designing multi-user versions of the UCSD Pascal™System.

d) Software Tools. The pre-compiled Units facility of current versions of the UCSD Pascal™System permits the implementation of large libraries of frequently needed routines. These routines can be used by a programmer as if they were extensions to the list of standard procedures and functions defined as part of the Pascal language. Only those library files actually needed by the programmer must be present at compile time and execution time. Work now starting is seeking an organized basis for designing the many separate Units that a typical applications programmer may want. Units are being implemented for applications ranging from the authoring of CAI packages to database management and interactive data capture.

e) Education Packages. The authoring package for creating Computer Aided Instruction materials is being thoroughly revised making used of the Units facility. We expect this package to continue evolving as experience grows in use of the existing introductory materials on Pascal programming, and as other CAI authors reports on their experiences. With the expected installation this fall of a distributed processing network connecting the microcomputers we use for regular teaching, experiments will begin in assisting students via remote communication from a teaching aide at a separate microcomputer.

In general, we expect that software resulting from any of this work, that turns out to be of good enough quality to distribute to others, will be made available via the licensing arrangement with SofTech Microsystems. As with the software already turned over to them, we expect SMI to add substantial value to the new products of the Project by turning those products into commercially maintainable form, and by providing continuing maintenance, support, and distribution services. All inquiries regarding distribution schedules should be directed to them (at the address given earlier in this newsletter), as the Project will retain very minimal staff resources to answer correspondence in the volume it has been received in recent months. Naturally, the Project does intend to provide pre-release programs, documentation, and other materials on an informal basis to sponsoring organizations, particularly those who are members of the UCSD Pascal™Associates program mentioned earlier.

Kenneth L. Bowles
Director

INSTITUTE FOR INFORMATION SYSTEMS
MAIL CODE C-021
UNIVERSITY OF CALIFORNIA, SAN DIEGO
LA JOLLA, CALIFORNIA   92093

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