

Fifteen Years of Forth Publishing with ACM

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ABSTRACT

The author has written numerous Forth programming language articles for various publications of the Association for Computing Machinery (ACM). These principally include the SIGForth Newsletter (1989 – 1994) and Sigplan Notices (1996 – 2006). These ACM journals also have included the work of several guest authors writing about Forth. This paper discusses some of the highlights of this fifteen-year epoch, which has informed a generation of computer professionals about the Forth language.

1 SIGForth: a Partnership of Forth Professionals and the ACM

Last year marked an unusual event: fifteen years of professional Forth articles and papers appearing in publications of the Association for Computing Machinery (ACM). From the beginning, this pairing was unexpected: after all, the ACM (founded in 1947, with a current membership near 80,000) is the world's oldest computing society [1]. Forth, on the other hand, is supposedly an arcane, non-mainstream, seldom-used programming language. Its role has been described [2]: “Hardware engineers love Forth. Traditional computer scientists hate it”.

Within this relatively unfavorable context, in 1988 George W. Shaw II of California, convinced ACM to let him and several friends create SIGForth (the special interest group for the Forth programming language). The following year the new ACM SIGForth generated two significant milestones: the first SIGForth Workshop and the SIGForth Newsletter.

At the first ACM SIGForth Workshop (Austin, Texas) presentations were given by Forth authorities such as: Robert Davis, Gary Feierbach, Larry Forsley, Tom Hand, Rick Hoselton, Howard Leverenz, Greg Lisle, Brian Mikiten, Leonard Morgenstern, Dietrich Neubert, George Shaw, Virgil Stamps, Rick VanNorman, Jack Woehr and myself [3]. The 1990 Workshop was held in Dallas and the 1991 meeting in San Antonio. Additional authors at these conferences included: Warren Bean, Alan Furman, Charles Johnsen, Phil Koopman, John Orr, Frank Sergeant, Paul Snow, John Wavrik, and others [4]. Chuck Moore spoke at the 1992 Workshop.

The SIGForth Newsletter would become a quarterly publication of about 32 pages, from Vol. 1, Issue 1, April 1989, to Vol. 4, Issue 4, December 1994). I reported on the first two years of SIGForth at the 1990 Rochester Forth Conference [5]. Later I described in detail what it was like to put together a publication like the Newsletter [6].

SIGForth was located “virtually” in Texas, providing the balancing point between the East and West Coast Forth establishments. It leveraged Forth enthusiasts in the great middle of the US, such as those in NASA (Houston) and the rapidly-forming “Silicon Hills” area (Austin).

2 Forth in SIGForth Newsletter: 1989 - 1994

To quote from my 1990 Rochester paper: “One of the goals of the [SIGForth] Newsletter was to set it apart from Forth Dimensions, an old and honored FIG publication. Many people have commented on the high quality of that first Newsletter. This may largely be attributed to the status of its contributors: Chuck Moore, George Shaw, Charles Curley, Alan Furman, C.H. Ting, Charles Johnsen and Klaus Schleisiek-Kern (in Germany)”.

ACM SIGForth Newsletter, Volume 1, Issue 1 (Spring 1989) gave Forth inventor Moore his “FORTHought” column, chairman Shaw his “Words from the Chairman” section, and the Newsletter editor (first Curley, later myself) a “Forth Estate” column. Founders Furman, Ting, Schleisiek-Kern and others contributed generously. A variety of issues and practices were covered: Forth commercialization¹, the F-PC compiler², Forth in Europe³, custom Forth CPU design⁴, Forth vendors⁵, the ACM SIGForth bylaws⁶, a summary of the first annual SIGForth Workshop⁷, and the ANS Forth progress report⁸. The Newsletter was off to a great start.

I served as editor for the Newsletter after Charles Curley’s departure, completing Volume 1, Issue 2 (Summer 1989), which Charles had begun. That issue contained the usual regular columns; we also published several excellent articles: for⁹ and against¹⁰ using text files in Forth, explored the cmForth metacompiler¹¹, saw how to implement high-level exception handlers¹², learned about state space searches¹³, and derived a string-based Forth CASE statement¹⁴. We included a book review for the Forth-like MINT programming language¹⁵.

Newsletter Volume 1, Issue 3 (Fall 1989) contained a Silicon Valley entrepreneur’s tale¹⁶, an RCA 1802 software simulator¹⁷ and notes on multiple-threaded vocabularies¹⁸. In Issue 4 (Winter 1989), the Holon system was reviewed¹⁹, the 1989 Rochester Forth Conference summarized²⁰, Forth stack frames described²¹, a new “duals” data structure concept proposed²², the Harris RTX-2001 processor reviewed²³ and PocketForth for the Macintosh²⁴.

1 Alan Furman, 5-6

3 Klaus Schleisiek-Kern, 18

5 C. H. Ting and Charles Curley, 21-23

7 George Shaw, 27

9 Tom Zimmer, 5

11 Jay Melvin, 7-8

13 Rick Hoselton, 14-17

15 Paul Frenger, 19-22

17 Alberto Pasquale, 24-25

19 Wolf Wejgaard, 13-16

21 Brad Rodriguez, 19-21

23 Paul Frenger, 31

2 C. H. Ting, 15-17

4 Charles Johnsen, 19-21

6 Brad Rodriguez and Charles Curley, 25-26

8 George Shaw, 28-29

10 Brad Rodriguez, 6

12 Brad Rodriguez, 11-13

14 Paul Frenger, 18-21

16 Russell Fish, 23+27

18 Harold M. Martin, 26-27

20 Larry Forsley, 17-18

22 Rick Hoselton, 22-28

24 Paul Frenger, 32

Volume 2, Issue 1 (Sept. 1990) dealt with Forth software licensing²⁵, a table-driven AI string matching system²⁶, the 1990 Rochester Forth Conference²⁷, a philosophy of Forth²⁸, and an RTX-2000 system review²⁹. Issue 2 (Dec. 1990) explored the online GENie Forth Roundtable³⁰, a Forth BNF parser³¹, and abstracts for the 1990 Rochester Forth Conference³². Issue 3 (March 1991) listed abstracts of the 1990 SIGForth Workshop³³, told how a tethered Forth system was developed³⁴, showed a stack assembler language for a compiler course³⁵, and described an RTX-2000 arbitrary waveform generator³⁶. Issue 4 (June 1991) included Forth programming tricks³⁷, a discussion of Forth compilation techniques³⁸, and a novel single-instruction computer design³⁹.

Volume 3, Issue 1 (Summer 1991) presented insights into Postscript⁴⁰, showed a convenient way to handle numbers⁴¹, discussed recursion and co-routines for B-trees⁴², further developed the single-instruction computer⁴³, described a programming system named for the mathematician Leibniz⁴⁴, and expounded on toys that can teach hardware and software interfacing⁴⁵. Issue 2 (Fall 1991) was a special Postscript Issue. It contained a tutorial on Postscript⁴⁶, described a Forth system written in PostScript⁴⁷, and reviewed PostScript Tutor software for the PC⁴⁸. Issue 3 (Winter 1991) was a special Hardware issue. Significant articles included: a stack-oriented multi-processor system called FLIP-FLOP⁴⁹, the BERT robot⁵⁰, distributing Forth⁵¹, random variables in Forth⁵², and driving stepper motors from a parallel port⁵³. Issue 4 (Spring 1992) was a special Review issue. It contained guidance for loading text files from screen-based Forths⁵⁴, some humorous Forth proverbs⁵⁵, a version of FIG-Forth for the Signetics 80C522⁵⁶, the obituary for Adm. Grace Murray Hopper⁵⁷, some robots that teach Forth⁵⁸, learning real-time industrial programming⁵⁹ and free-form number evaluation⁶⁰. Reviews included: MI-SHELL, a Forth-like MS/DOS shell⁶¹, the Plain English language⁶², UTIL for palm computers⁶³, M-CODE direct assembler for x86 CPU⁶⁴, The Computer Journal magazine⁶⁵, and a Forth Applications book for the PC⁶⁶.

25 Brad Rodriguez, 13-14

27 Larry Forsley, 19-25

29 Virgil Stamps, 32

31 Brad Rodriguez, 13-18

33 Howard Harkness, 9-10

35 Gerald Wildenberg, 20-22

37 Frank Sergeant, 7-8

39 P. A. Laplante, 23-26

41 Paul Frenger, 10

43 P. A. Laplante, 21-22

45 Paul Frenger, 25-29

47 Mitch Bradley, 20-24

49 Peter Grabienski, 5-11

51 Frank Sergeant, 19-20

53 Paul Frenger, 25-28

55 Rick Hoselton, 7

57 John Jeter, 13

59 C. A. Maynard, 19-22

61 Rick Hoselton, 7

63 Royal Randall, 23

65 Mike Foley, 27

26 Paul Frenger, 15-18

28 Jay Melvin, 31

30 Alan Furman, 7-8

32 Larry Forsley, 19-25

34 Harold M. Martin, 17-19

36 Paul Frenger, 27-31

38 Greg Lisle, 21-22

40 Paul Snow, 7-9

42 Rick Hoselton, 11-16

44 Andreas Goppold, 23-24

46 Don Lancaster, 15-19

48 Paul Frenger, 32

50 Karl Brown, 15-18

52 Matthew M. Burke, 21-24

54 Brad Rodriguez, 5-6

56 Alberto Pasquale, 11-13

58 C. Ronald Kube, 14-16

60 John R. Hayes, 28

62 Paul Frenger, 9-10

64 Paul Frenger, 25-26

66 Paul Frenger, 29-30

Volume 4, Issue 1 (Summer 1992) was a special Genie Forth Roundtable issue. Interactive discussions with special guests took place on the Genie dial-up network and the transcripts were later posted to the Newsletter. An introduction was provided by a Genie SysOp⁶⁷; guests included the public relations guru for FIG⁶⁸, the editor of FIG's Forth Dimensions magazine⁶⁹, the new SIGForth chairman⁷⁰, a noted Forth author and instructor⁷¹, a Ford Motor Company engineer⁷², and an ANS Forth Standards team member⁷³. Other articles included Chuck Moore's tribute to FIG-Forth⁷⁴, A review of the 1992 Rochester Forth Conference⁷⁵, a book review of Scientific Forth⁷⁶, and the Forth Successes Project report⁷⁷. Issue 2 (Fall 1992) was a Forth Internals issue. Topics discussed included the **CREATE .. DOES>** pair⁷⁸, design of threaded code interpreters⁷⁹, syntax of user-defined local variables⁸⁰, the Forth L^AT^EX Engine concept⁸¹, and JSR Forth for Amiga⁸². A review of the PIC 16C5x microcontroller was presented⁸³. In the news: the SIGForth executive committee bestowed the 1992 SIGForth STACK Award on founder George Shaw, and the 1993 STACK Award on Newsletter editor Paul Frenger.

Issue 3 (December 1993) was the 1992 SIGForth Workshop Proceedings issue, part I. These papers were presented: Forth on the Space Shuttle⁸⁴, A first Forth course for engineers⁸⁵, construction of a Forth CPU⁸⁶, and a C-to-Forth compiler⁸⁷. Regular Newsletter articles were represented by my discussion of desktop publishing⁸⁸, a review of Yerkes Forth for the Mac⁸⁹, and a critical look at the ANS standardization process⁹⁰. Issue 4 (December 1994) contained part II of the 1992 SIGForth Workshop Proceedings. These papers were presented: a software-stack data type⁹¹, Forth GUI design and MetaWINDOW⁹², Forth's role in mainstream computer science courses⁹³, and computer algebra in Forth⁹⁴.

Reading these articles and papers by the first generation of Forth practitioners is awe-inspiring. Some of this is preserved in the ACM Digital Library [7], but much material is out of print.

3 Forth in Sigplan Notices: 1996 to Today

The Forth Report appeared in Sigplan Notices on a frequent but irregular basis, in non-conference issues which allowed columns and articles. I have chronologically summarized these forty-four

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|--------------------------------|--|
| 67 Gary Smith, 3-4 | 68 Jan Shepherd, 5-6 |
| 69 Marlin Ouverson, 8-10 | 70 Irving Montanez, 11-12 |
| 71 Michael Ham, 17-19 | 72 Len Zettel, 21-24 |
| 73 Ron Braithewaite, 27-30 | 74 Chuck Moore, 2 |
| 75 Irving Montanez, 20 | 76 Julian V. Noble, 31-32 |
| 77 Darrel Johansen, 13-14 | 78 Paul Thomas, 6-8 |
| 79 P. Joseph Hong, 11-16 | 80 John R. Hayes, 19-20 + 26 |
| 81 Paul Frenger, 21-23 | 82 Mike Haas, 24-26 |
| 83 Paul Frenger, 27-28 | 84 Robert T. Caffrey, et al, P1-P8 |
| 85 Frank N. DiMeo, P9-P11 | 86 Yong M. Lee and Edward Conjura, P12-P16 |
| 87 Alexander Sakharov, P17-P18 | 88 Paul Frenger, 4 + 32 |
| 89 Bob Loewenstein, 5-6 | 90 Michael L. Gassanenko, 27-31 |
| 91 Jon W. Osterlund, P19-P22 | 92 P. D. Lopez, P23-P27 |
| 93 Richard E. Haskell, P28-P34 | 94 Julian V. Noble, P35-P43 |

Forth Report columns and described them in detail [8, 9]; these reviews are available online to subscribers via the ACM Portal. These articles fall into the following categories: object-oriented Forths, conference reports, robotics, space applications, game construction, artificial intelligence, Forth groups and personalities, Forth vendors, Forth techniques, and miscellaneous applications and topics. They are briefly listed below.

Volume 31, Number 4 (April 1996) inaugurated the Forth Column in Sigplan Notices with two guest columns^{95, 96} on Object Oriented Forths. In Number 8 (August 1996) I reviewed the 1996 Rochester Forth Conference⁹⁷. In Number 12 (December 1996) I listed a number of useful Forth resources for Sigplan readers⁹⁸.

In Volume 32, Number 2 (February 1997) our guest author described his Beetle Forth Virtual Processor⁹⁹. In Number 4 (April 1997) I discussed robotics programming languages¹⁰⁰; with Number 6 (June 1997) I focused attention on Forth as a robotics language¹⁰¹. Forth implemented on single board computers¹⁰² was the topic for Number 11 (November 1997).

Volume 33, Number 2 (February 1998) contained my insights at the very popular EuroForth'97 Conference, held at Oxford University¹⁰³. The topic in Number 3 (March 1998) was "The Growing Machine", an interesting Pre-Forth language created in 1996 by Thomas Ostrand as a master's degree thesis¹⁰⁴. Issue Number 4 (April 1998) describes¹⁰⁵ a humorous undergraduate student project, "The Talking Toaster". Number 6 (June 1998) describes¹⁰⁶ NASA's use of Forth in outer space. Number 8 (August 1998) was a tribute to the FIG-Forth language¹⁰⁷. Number 9 (September 1998) discussed the use of Forth in online gaming¹⁰⁸ with MUFs, MUDs, MUCKs and MOOs. Number 12 (December 1998) examined the controversial MindForth application by Arthur T. Murray, as well as my own use of Forth in AI and robotics¹⁰⁹.

Volume 34, Number 2 (February 1999) discussed the use of Forth in the OTA (Open Terminal Architecture) smart card project¹¹⁰. Number 4 (April 1999) spoke of Parallel Forth¹¹¹. The guest author¹¹² for Issue 6 (June 1999) described "Ficl, FORML, and Object Forth". The guest author¹¹³ for Issue 12 (December 1999) described his "Firmware Factory" version of IEEE 1275.

I started off Volume 35 (Number 2, February 2000) with a discussion¹¹⁴ of "The Ultimate RISC: A Zero-Instruction Computer", which unexpectedly described an analog, not digital, computer.

95 Brad Rodriquez and W.F.S. Poehlman, 39-42	96 Leonard Zettel, 43-44
97 Paul Frenger, 26-27	98 Paul Frenger, 29-32
99 Reuben Thomas, 22-25	100 Paul Frenger, 27-31
101 Paul Frenger, 19-22	102 Paul Frenger, 21-24
103 Paul Frenger, 31-33	104 Paul Frenger, 21-23
105 Paul Frenger, 21-25	106 Paul Frenger, 24-26
107 Paul Frenger, 28-31	108 Paul Frenger, 24-26
109 Paul Frenger, 25-31	110 Paul Frenger, 36-38
111 Paul Frenger, 28-32	112 John Sadler, 32-35
113 Brad Eckert, 30-33	114 Paul Frenger, 17-24

Number 3 (March 2000) told how MicroProcessor Engineering, Ltd's "Modular Forth" could be used for learning the Forth language¹¹⁵. Number 6 (June 2000) described what I call the "GOTO Machine", a 32-bit Forth CPU which has no program counter¹¹⁶. Issue Number 8 (August 2000) talked about using Forth to create the FreeBSD Bootloader¹¹⁷. The guest author¹¹⁸ for Issue Number 12 (December 2000) told of the ongoing success of FIG-UK.

Volume 36, Number 2 (February 2001) told how to use Forth for Extreme Programming¹¹⁹. Number 4 (April 2001) showed how Forth hardware and software enabled NASA's NEAR satellite to touch-down on an asteroid in deep space¹²⁰. Issue Number 6 (June 2001) probed the Forth language's fate after several serious setbacks¹²¹. Issue 12 (December 2001) discussed the use of Forth to control LEGO "Mindstorms" toy robots¹²².

The guest author for Volume 37, Number 2 (February 2002) gave an illuminating exposition on Forth Jump Tables and State Machines¹²³. In Number 4 (April 2002) I described use of Forth as an add-on ("strap-on") solution to avoid technological obsolescence¹²⁴. In Number 6 (June 2002) the popular "DOOM" PC game and its Forth equivalent were showcased¹²⁵. Issue Number 8, (August 2002) reviewed Quartus Forth for the Palm Pilot platform¹²⁶. Number 12 (December 2002) described my concept of intelligent simian robots for Mars and space exploration¹²⁷.

Volume 38 Number 4 (April 2003) reviewed using Forth, Inc's SwiftForth under Windows¹²⁸. Number 8 (August 2003) described the Forth-like JOY functional programming language¹²⁹.

In Volume 39, Number 2 (February 2004) the Dutch FIG was showcased, along with one of its most prolific members, Albert van der Horst¹³⁰. Issue Number 3 (March 2004) described how Forth-based IEEE 1275 helped make the Apple Macintosh such a great machine¹³¹. Number 8 (August 2004) gave examples of embedded programming with Forth¹³². Number 12 (December 2004) returned to Forth and AI with my human intellect growth and development simulator¹³³.

Volume 40, Number 2 (February 2005) kicked off with my humorous proposal for a minimal stack-based transistor-sized 3-pin microcontroller¹³⁴. Number 4 (April 2005) discussed how a 4-bit Forth-based Atmel microcontroller in your car tires warns you of dangerous underinflation¹³⁵. Issue Number 8 (August 2005) described how a small Australian company used Forth to develop a machine-vision application to sort fruit and vegetables without human intervention¹³⁶.

115 Paul Frenger, 25-30

117 Paul Frenger, 15-17

119 Paul Frenger, 20-23

121 Paul Frenger, 23-25

123 Julian V. Noble, 14-19

125 Paul Frenger, 14-17

127 Paul Frenger, 9-13

129 Paul Frenger, 15-17

131 Paul Frenger, 7-11

133 Paul Frenger, 11-16

135 Paul Frenger, 5-8

116 Paul Frenger, 21-24

118 Chris Jakeman, 19-21

120 Paul Frenger, 21-24

122 Paul Frenger, 16-19

124 Paul Frenger, 17-20

126 Paul Frenger, 6-8

128 Paul Frenger, 12-15

130 Paul Frenger, 7-10

132 Paul Frenger, 8-11

134 Paul Frenger, 5-10

136 Paul Frenger, 7-10

Volume 40, Number 11 (November 2005) and Volume 41, Number 4 (April 2006) are the above-cited “Ten Years of Forth in ACM Sigplan Notices” summaries [references 8-9].

4 Postmortem and Conclusion

After a few productive years, George Shaw relinquished SIGForth to Irving Montanez, who served ably as Chairman. Unfortunately, it became obvious that SIGForth (initially subsidized by ACM as a new SIG) would not become self-sustaining. SIGForth never had more than 1200 members; it “ran out of gas” by 1995. Irving was able to save some bits and pieces of SIGForth. For example, after 1991 he folded the SIGForth Workshops into subsections of other ACM meetings for the next two years. He also arranged to incorporate the remnant of the SIGForth Newsletter as a periodic Forth column in the popular Sigplan Notices monthly publication, starting with Volume 31, Number 4 (April 1996) as illustrated above.

Why did SIGForth fail? Perhaps the dissonance between the Forth language and ACM’s clientele (mentioned earlier) finally caught up with it. Perhaps SIGForth did not deliver what its members wanted. Or possibly it was just part of the general decline in interest in Forth in the US, as reflected by the loss of the annual Rochester Forth Conference and the American Forth Interest Group itself. The reluctance of Forth practitioners to write copy for the Newsletter was also contributory (possibly because of copyright issues). Still, ACM never seemed to be part of the problem; it was always a most charming and helpful sponsor for Forth activities over the years.

Why has the Forth Column in Sigplan Notices been more successful? One reason is that Sigplan is an eclectic publication; the Forth topics contribute to its diversity and aren’t required to pull the entire weight of the journal. The Forth topics have been carefully chosen to balance professional issues, education and entertainment (a bill of fare which might be controversial in a Forth-only publication). I believe it is permissible to wear the Jester’s Cap to teach a valuable lesson to an unsuspecting student ... especially a lesson not taught anywhere else.

Those of us who respect and use Forth should be glad that ACM in general, and Sigplan Notices in particular, continue to provide us with a prestigious forum for our Forth programming language theories and applications. With a resurgence of interest in Forth resulting from broad industry licensing of the Moore Microprocessor Patent (MMP) Portfolio [10] and the new Intelliasys SEAforth-24 multicore processor [11], this association will continue for years to come.

5 Last-Minute Update!

I have recently obtained permission from ACM to place the entire content of my SIGForth Newsletter and Sigplan Notices articles / columns on a soon-to-be-constructed personal website, probably linked to the Forth WebRing [12]. The works of guest authors will be included as soon as their permission can be obtained. This material will be available for download at no cost for personal, educational and noncommercial use. The additional SIGForth Workshops material is being negotiated even as this paper is being written. Thank you very much, ACM!

6 References

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Author's Biography

Paul Frenger is a medical doctor who has been professionally involved with various kinds of computers since 1976. He has worked as a computer consultant, published over one hundred thirty articles in the bioengineering and computer literature, edited the ACM SIGForth Newsletter for four years, contributed to ACM Sigplan Notices for eleven, and acquired three computer patents along the way. Paul was bitten by the reverse Polish bug in 1981 and has used Forth ever since. Being both a physician and a systems developer, Paul believes that the term 'hacker' is doubly appropriate in his case.