TRIVIA HUNT ANSWERS **CS304, January 1989**

1. Who were the winners of the first Computer Science Trivia Hunt at Stanford? *5 points each*
What did they win? *10 points*

Tomás Feder, Barry Hayes, Tom Henzinger, and Alex Wang. (Reference: CS1154, Appendix A.) They received certificates (printed with POX, a historic computer typesetting system); they were also treated to dinner at Late for the Train restaurant by Don and Jill Knuth on 10 March 1988. (Source: The team members.)

2. What computer scientist was born on 23 June 1912? *15 points*

Alan Mathison Turing. (Ref: Hodges, *Alan Turing: The Enigma*, p. 5.)

3. In what house did Bill Walsh live when he was a Stanford coach? Who lives there now? *15 points each*

He was coach in 1977–1978. According to the Stanford Faculty/Staff Directory, 1978, he lived at 903 Cottrell Way, Stanford CA 94305; this is confirmed by the present owner, Prof. Thomas J. Hughes (chair of Mechanical Engineering). [A plausible, but false, answer was also submitted: Inquirers at the Athletic Department were told that Walsh lived in Menlo Park; and there is a Wm. D Walsh living in Menlo Park, listed continuously in local phone books since 1977. However, *that* Bill Walsh was a high school football coach, not college or pro; the "real" Bill Walsh lives on Valparaiso Avenue and has an unlisted phone number. Incidentally, Walsh's announcement of his retirement was front page news on Trivia Hunt day.]

4. What Stanford mathematics professor wrote one of the first papers ever published about the Tower of Hanoi? What were the dates of his birth and death? What is his relationship to Professor Floyd of our department? *15 points each*

Robert Edgar Allardice was co-author of "La Tour d'Hanoï," *Proceedings of the Edinburgh Mathematical Society* **2** (1884), 50–53; he was born 2 March 1862, came to Stanford in 1892, became emeritus in 1927, and died on 6 May 1928. (Reference: Poggendorf's *Handwörterbuch*; *Proceedings of the Royal Society of Edinburgh* **48** (1927–1928), 209–210.) Floyd lives at 895 Allardice Way.

5. What Stanford computer has its name displayed in stained glass? *15 points*

The SUMEX-AIM computer in Stanford Medical School. [People also found 'Solomon', 'charity', 'thing', 'sheep', 'how', and 'why' on the windows in Stanford Memorial Church; these are all names of computers at Stanford, according to `/etc/hosts`.]

6. What are the common names of *Formica rufa* Linnæus? *10 points each*

The fallow ant, according to Wheeler, *Ants*, p. 8, or McCook, *The Agricultural Ant of Texas*, p. 152; also called hill ant, wood ant, horse ant, and Waldameise (German), according to Donisthorpe, *British Ants*, p. 248; also red ant, Grizmek's *Animal Life*, vol. 2.

7. Problem 4 in this year's CS304 is based on an article by Leslie Valiant. Find all published papers that refer to his article and give a full citation for every such paper in the following style: L. G. Valiant, "Short monotone formulae for the majority function," *Journal of Algorithms* **5** (1984), 363–366. *10 points each*

The following can be found via *Science Citation Index*: Joel Friedman, "Constructing $O(n \log n)$ size monotone formulae for the kth threshold function of n boolean variables," *SIAM Journal on Computing* **15** (1986), 641–654. David S. Johnson, "The NP-completeness column: An ongoing guide," *Journal of Algorithms* **7** (1986), 289–305. Ravi B. Boppana, "Threshold functions and bounded depth monotone circuits," *Journal of Computer and System Sciences* **32** (1986), 222–229. S. A. Lozkin and A. A. Semenov, "On construction of a complete system of compression functions and on complexity of monotone realization of threshold boolean functions," *Lecture Notes in Computer Science* **278** [*Fundamentals of Computation Theory*, proceedings of FCT87 in Kazan, USSR] (1987), 297–300. And, there are two other references in publications that (unfortunately) are not yet covered by Science Citation Index: Ravi B. Boppana, "Amplification of probabilistic boolean formulas," *Proceedings of the 26th Annual Symposium on Foundations of Computer Science* (1985), 20–29. (This one, unknown to Knuth before the Trivia Hunt, is quite relevant to Problem 4.) M. Karchmer and A. Wigderson, "Monotone circuits for connectivity require super-logarithmic depth," *Proceedings of the 20th Annual Symposium on Theory of Computing* (1988), 539–550.

8. What identification numbers and dates are stamped on the following Bench Marks of the U. S. Coast and Geodetic Survey on Stanford's campus? (1) near a monumental horse; (2) near a mosaic; (3) near a potted umbrella tree; (4) near the 9th fairway. *25 points each*

Bench Marks are shown on the Palo Alto quadrangle of the U. S. Geological Survey maps in Branner Library. (1) B151, 1933, at the base of the statue of Sherwood, near the Old Red Barn on Fremont Road. (2) R875, 1954, embedded in the NE corner of the Stanford Art Museum building. (3) A151, 1933, in concrete steps by the main entrance to the Carnegie Institution of Washington Plant Biology building. (4) C151, 1933, on top of a granite rock outcropping between the fairway and San Francisquito Creek, not far from the 9th tee of Stanford Golf Course. Another one (D151, 1933) appears near the 7th fairway. Still another (U110, 1932) is embedded in sandstone in the main quad, on a corner of building 310 facing the rear of Memorial Church. Several of us searched fruitlessly for yet another near the Children's Hospital. According to the Geological Survey in Denver, the Army Corps of Engineers came to Stanford in 1938 to determine the horizontal locations of the bench marks whose vertical elevations had been previously determined.

9. What artist made a painting of Jane Stanford's jewel collection, before she sold it to help pay faculty salaries? What were the dates of his birth and death? *10 points each*

Astley David Montague Cooper's painting entitled Mrs. Stanford's Jewel Collection hangs in the Stanford Museum, and it says he lived 1856–1924. Further research via the Master Index of biographical reference books leads to *Artists of the American West*, where his death date is given as 10 September 1924 in San Jose. The *San Jose Mercury Herald* for 11 September 1924, p. 11, gives his birthdate as 23 December 1856. According to A. Nagel, *Iron Will: The life and letters of Jane Stanford*, Mrs. Stanford used money from the sale of the jewels for an endowment whose income was "to be used exclusively for the purchase of books and other publications"; hence, the use of jewel money to pay faculty salaries is apparently a myth, although there was definitely a period when she contributed her own funds to help the faculty while her husband's estate was tied up in court.

10. What three faculty members of Stanford's Computer Science Department were born on the same day of the month (but not necessarily in the same month)? *30 points*

The `lookup` program on polya or the `find` program on SAIL gives Charles Bigelow on July 29, David Cheriton on March 29, and Gene Golub on February 29; also Consulting Professor Joe Halpern on May 29, and Visiting Professor John Sowa on March 29. If we exclude professors of the latter type, there are no two with the same birthday, although the "birthday paradox" says that there probably should be. Another answer, using a different database: John Hennessy, 22 Sep 1952; Yoav Shoham, 22 Jan 1956; Jeffrey Ullman, 22 Nov 1942.

11. What were the date and place of the first battle in the war between Mexico and the United States? *10 points each*

8 May 1846 at Palo Alto battlefield, Cameron County, Texas. (First blood was drawn on April 24 when an American reconnoitering party was attacked and captured; but the Palo Alto battle involved thousands of troops.)

12. Identify the author and source of the following quotations: *10 points for each author*
15 points for each source

a. He teaches him to hick and to hack, which they'll do fast enough of themselves . . . —fie upon you.

Shakespeare, *Merry Wives of Windsor*; Act IV, Scene 1, line 60 (or other line numbers in other sources). The NeXt computer has this online.

b. As a slow-witted human being I have a very small head and I had better learn to live with it and to respect my limitations and give them full credit, rather than try to ignore them, for the latter vain effort will be punished by failure.

Dijkstra, in *Structured Programming*, Academic Press, 1972, p 3.

c. My thesis is that high-performance systolic arrays can be used effectively by providing to the user a simple machine abstraction supported by optimizing compilation techniques. The user sees the systolic array as an array of sequential processors communicating asynchronously.

Monica Sin-Ling Lam, *A Systolic Array Optimizing Compiler* (thesis), CMU-CS-87-187, p. 2.

13. Obtain xerographic copies of the title pages of the journal articles in which (1) Binet published "Binet's formula" for Fibonacci numbers; (2) Chebyshev published "Chebyshev's inequality"; (3) Vandermonde published "Vandermonde's convolution". *15 points each*

(1) J. Binet, "Mémoire sur l'intégration des équations linéaires aux différences finies, d'un ordre quelconque, à coefficients variables," *Comptes Rendus hebdomadaires des séances de l'Académie des Sciences* (Paris) **17** (1843), 559–567. (2) P.-L. Tchébyshef, "Des valeurs moyennes," *Journal de Mathḿatiques pures et appliquées*, series 2, **12** (1867), 177–184; that's a translation of the Russian original, which was "O srednikh velichinakh," *Matematicheskiĭ Sbornik'* **2** (1867), 1–9. Stanford's library doesn't own that journal, but copies exist at Berkeley, Brown, Columbia, Duke, Illinois, Penn, and Yale, as well as the Library of Congress, according to the National Union Catalog. With a friend at one of those places it would have been possible to fax the page (but nobody did). Karl Pearson, in *Biometrika* **12**, p. 285, said that he couldn't trace the Russian original "at all." The French version was reprinted in Chebyshev's *Œuvres*, volume 1, 685–694; the Russian original was reprinted in his *Polnoe Sobranie Sochineniĭ*, volume 2, 431–437 (and Stanford does own that). (3) A. Vandermonde, "Mémoire sur des irrationnelles de différens ordres avec une application au cercle," *Histoire de l'Académie Royale des Sciences* (1772), part 1, 71–72; *Mémoires de Mathématique et de Physique, Tirés des Registres de l'Académie Royale des Sciences* (1772), 489–498.

14. What are the next two numbers in the sequence 1, 1, 2, 5, 12, 35, 108, 369, ...? Who first computed them? Who first computed the values 108 and 369? *10 points each*

Sloane's *Handbook of Integer Sequences* identifies this as sequence #561, the number P_n of polyominoes made from n squares (possibly enclosing one or more blank squares). Sloane refers to a paper by W. F. Lunnon, "Counting polyominoes," *Computers in Number Theory* (Academic Press, 1971), 347–372; Lunnon discusses the history on pp. 356–357. Chasing down his references, we find that R. Read computed $P_9 = 1285$ in "Contributions to the cell growth problem," *Canadian Journal of Mathematics* **14** (1962), 1–20, where an incorrect value $P_{10} = 4466$ is stated; the correct value $P_{10} = 4655$ must therefore have been computed first by T. R. Parkin, L. J. Lander, and D. R. Parkin in unpublished work announced at the SIAM fall meeting in 1967 (according to Lunnon). Going back from Read, we find an article by Frank Harary, "Unsolved problems in the enumeration of graphs," *Magyar Tudományos Akadémia, Matematikai Kutató Intézetének, Közleményei* **5** (1960), 63–95, where he states that Golomb's incorrect claim $P_7 = 109$ was corrected by Stein, Walden, and Williamson, who also computed P_8. They did their calculations on the MANIAC II at Los Alamos, according to Read. Incidentally, the calculation of P_n seems to be fraught with difficulty, since Lunnon claims that Parkin et al. had P_{15} wrong.

15. Who coined the term 'Artificial Intelligence'? What was research in that field called previously? *15 points each*

John McCarthy chose it late in 1955, and used it in his grant application to the Rockefeller Foundation for the 1956 Dartmouth Summer Research Project on Artificial Intelligence. Minsky drafted his essay "Steps toward artificial intelligence" after that key conference. Previously the subject had been called 'automata studies'; see the book *Automata Studies*, edited by McCarthy and Shannon, in which W. Ross Ashby writes about 'machines with "synthetic" intellectual powers'. Another term, proposed by Newell and Simon, was 'complex information processing' (RAND report P-850); see their book *Human Problem Solving*, 883–884. McCarthy's recollections are documented in *Machines who think* by Pamela McCorduck, p. 96.

16. Who wrote the report STAN-CS-88-1233? What is that author's favorite color? *10 points each*

Ken Ross, our friendly TA, likes sky blue best (finger `kar @ polya`).

17. Suppose the words of English were alphabetized from right to left instead of from left to right, so that all words ending in `a` would come first, then all words ending in `b`, etc. What would be the last word in the dictionary? What words would immediately precede and follow `trivia`? Note: Abbreviations, proper nouns, and hyphenated words do not count. If your words are not commonly known, you must state their meaning and give the name of a standard English dictionary that lists them. *15 points each*

According to the 'Normal and reversed word list...' in the Math/CS library (PE1680 N6), which is based on Webster's Second Unabridged and other dictionaries, the last word is `bruzz`, a wheelwright's corner chisel. That dictionary contains the sequence `parathyroprivia`, `trivia`, `Opiconsivia`, `plenalvia`, `salvia`. The proper name `Opiconsivia` doesn't count; according to Webster's Second, `parathyroprivia` is a disease, a deficiency of hormones from the parathyroid glands; according to Chambers's Technical Dictionary, `plenalvia` is "impaction of the rumen of cattle"; and `salvia` is a genus of herbs that includes sage. Of these words, only `salvia` can be found in Webster's Third Unabridged. But there are better answers: The Oxford English Dictionary contains `vuzz`, a southern variant of furze (an evergreen shrub); the Official Scrabble Players' Dictionary mentions `lixivia`, the plural of lixivium—solutions obtained by lixiviation (also in OED).

18. Identify the computer language in which each of the following program fragments is written: *10 points each*

a. `+/0=100|VV>0`

APL (from Gilman and Rose, *APL*, exercise 8H).

b. **procedure** Innerproduct(a, b) Order:(k, p) Result:(y); **value** k; **integer** k, p; **real** y, a, b;
begin real s; $s := 0$; **for** $p := 1$ **step** 1 **until** k **do** $s := s + a \times b$; $y := s$ **end** Innerproduct

Algol 60 (from the original report, *CACM* **3** (1960), 311); reprinted in Horowitz, *Programming languages: A grand tour.*

c.
```
stacks←(Array new:3)collect:[:each|OrderedCollection new].
(height to: 1 by: -1)do:[:each|(stacks at: 1)addFirst:
  (Character value:($A asciiValue) + each - 1)].
```

Smalltalk (from Kaehler and Patterson, *A Taste of Smalltalk*, p. 45).

d. *linkage* **class** *link*;
begin procedure *out*;
if *suc* =/= *none* **then begin** *suc.pred* :– *pred*; *pred.suc* :– *suc*; *suc* :– *pred* :– *none* **end** ...**end**

SIMULA 67 (from Helmut Rolfing, *SIMULA*, p. 165).

e.
```
10100800
00E88C03
00000000
00000004
```

The ant language of Problem 5. (It also disassembles into valid but uninspiring 68000 code, but it is definitely not VAX code.)

f.
```
IF DAY EXCEEDS 31 THEN SUBTRACT 31 FROM DAY;
MOVE "APRIL" TO MONTH; OTHERWISE MOVE "MARCH" TO MONTH.
```

COBOL (from *CACM* **5** (1962), 210).

g.
```
Procedure Mguvar (x,y)
    Begin Includes(x,y) ==> Return(False),
          Return([x/y])
    End
```

Demonstration language in Genesereth and Nilsson, *Logical Foundations of Artificial Intelligence*, p. 68.

h. $top\ y_2 = top\ y3 = .45\ bot\ y_0;\ z_2 = whatever[z_1, z_{4r}];$

METAFONT (from Knuth's *METAFONTbook*, p. 164)

i.
```
R2      J60
    70  J8
    40  H0
    40  H0
        R2
    12  H0
        J65  J68
```

IPL-V (from Sammet, *Programming Languages*, p. 392).

j.
```
: SQUARE DUP *;
: CUBE DUP SQUARE *;
: FOURTH DUP CUBE *;
```

FORTH (from Churlian, *Beginning FORTH*, p37); note also `: BETTERFOURTH SQUARE SQUARE;`

k.
```
Für j=1(1)n :
h_{j-1}+(a_{ij}b_{jk})⇒h_j
Ende Index j
```

From Heinz Rutishauser, *Automatische Rechenplanfertigung*... (1952), p. 26.

l.
```
picnic(Day) :- holiday(Day,july_4), !.
picnic(Day) :- weather(Day,fair), weekend(Day).
```

Prolog (from Jean Rogers, *A Prolog Primer*, p. 118).

m. *Node* = **pointer to** *Object*;
Object = **record** *key*, *x*, *y*: **integer**; *left*, *right*: *Node* **end**;
Rectangle = **pointer to** *RectObject*;
RectObject = **record**(*Object*) *w*, *h*: **real end**;
... **if** *p* **is** *Rectangle* **then** *area* := *p*(*Rectangle*).*w* ∗ *p*(*Rectangle*).*h*; ...

Oberon (see N. Wirth, "From Modulo to Oberon," *Software—Practice & Experience* **18** (1988), 66–77). But in Oberon one must type the reserved words all in uppercase letters.

n.
```
/increase-x{xpos radius add /xpos exch def}def
/doCircle{xpos ypos radius 0 360 circ stroke}def
{xpos pagewidth le {doCircle increase-x}{exit}ifelse}loop
```

PostScript (from Adobe Systems, *PostScript Language Tutorial and Cookbook*, pp. 69–70).

o. $testr[x, p, f, u] \leftarrow$ **if** $p[x]$ **then** $f[x]$ **else**
if $atom[x]$ **then** $u[\,]$ **else**
$testr[cdr[x], p, f, \lambda{:}testr[car[x], p, f, u]]$.

McCarthy's publication language for LISP (from Wexelblatt, *History of Programming Languages*, p. 180); it is properly called M-language (see p. 177 of that book).

Scores:

Problem	Rajeev Alur Tom Henzinger* Sherry Listgarden Alex Wang*	Adam G Urs H Sanjoy M Daniel S	Eddie C Dinesh K Patrick L Michael Y	Arul M Steven P Alon L Robert K Roland C
1	30	30	30	18
2	15	15	15	15
3	30	10	30	30
4	60	20	20	60
5	35	15	20	10
6	30	10	50	10
7	43	30	10	10
8	80	120	25	75
9	35	26	35	16
10	50	30	40	30
11	25	25	25	25
12	75	50	0	0
13	40	40	30	20
14	30	35	10	20
15	30	15	30	20
16	20	1	20	20
17	30	40	40	45
18	62	72	22	51
Totals	720*	584†	452	475

*Successfully defending their championship performance of 1987
†The winning score from this year's CS304 students