USACO UPDATE

Rob Kolstad,
USACO Head Coach

USENIX is the Platinum sponsor of the USA Computing Olympiad, the premier pre-college computer programming competition. The USACO conducts half a dozen Internet-based programming contests through the year, hosting about 1,000 students in each one. The USACO contests are "open" in the sense that they encourage participation from students around the world.

Each contest is typically offered not only in English but also in another half-dozen languages.

Surprising to some Americans, a huge percentage of non-USA students speaks English with enough skill to solve computer contest problems. Contests commonly garner students from 66 different countries.

Contests are complemented with 200 hours of online training. This training program offers instruction in the relatively esoteric area of algorithmic programming and requires students to solve sets of contest-like programming tasks before moving on to subsequent sections of training.

For USA students, the goal of the contests is to earn one of 16 berths at the USA Invitational Computing Olympiad (USAICO), a nine-day competition, conducted this year at Colorado College in Colorado Springs, Colorado. While the arrival and departure days are relatively short (arrival mid-afternoon at the Denver airport, departure at 0730 to return to the airport), the intervening week is a busy one. Four three-hour programming contests and two five-hour contests keep the students on their toes as they vie for four positions on the USACO traveling team, which will represent the USA at the International Olympiad on Informatics. This year's IOI will be held August 15–22 in Zagreb, Croatia.

The sixteen participants and six coaches hailed from around the country, with no school truly dominating the list:

Seniors: Zarathustra Brady, Magnolia Science Academy, Van Nuys, CA; Richard McCutchen, Montgomery Blair High School, Rockville, MD; John Pardon, Durham Academy Upper School, Chapel Hill, NC; Bohua Zhan, West Windsor-Plainsboro HS South, Plainsboro, NJ

Juniors: Artur Dmowski, Stuyvesant HS, Corona, NY; Boping Lai, The Roxbury Latin School, Lexington, MA; Kevin Lee, Bergen County Academies, Closter, NJ; Yongqian Li, Niskayuna High School, Niskayuna, NY; Spencer Liang, The Harker School, Cupertino, CA; Haitao Mao, Thomas Jefferson High School for Science and Technology, Vienna, VA; Jacob Steinhardt, Thomas Jefferson High School of Science & Technology, Vienna, VA; Ye Wang, Nicolet High School, River Hills, WI; Louis Wasserman, Montgomery Blair HS, Derwood, MD

Sophomore: David Benjamin, Harrison High School, West Lafayette, Indiana

Freshmen: Neal Wu, Baton Rouge Magnet High School, Baton Rouge, LA; Scott Zimmermann, Montgomery Blair High School, Gaithersburg, MD

Ye Wang is the first exchange student to qualify for the USAICO competition. Although she attends high school in Wuhu, China, she spent her junior year in River Hills, Wisconsin, and thus was eligible to represent the USA in the national and international competitions.

Half a dozen coaches set problems and shepherded the students through the week. They included director Don Piele, recently retired from the University of Wisconsin; Rob Kolstad, aspiring consultant; Brian Dean, up-and-coming faculty member at Clemson University; Berkeley grad student Percy Liang; MIT student Alex Schwendner; and problem-setter extraordinaire Richard Peng, who has just completed his first year at Canada's prestigious University of Waterloo in Toronto, Ontario.

The four contestants chosen to represent the USA were seniors Richard (Matt) McCutchen and John Pardon, junior Ye Wang, and sophomore David Benjamin (see photograph). This is the

Winners Ye Wang, David Benjamin, John Pardon, and Richard (Matt) McCutchen, with director Don Piele (center)

first time a woman has earned a berth on the extraordinarily competitive traveling team. These students solved extremely challenging problems like "Moving the Hay," by Richard Peng:

"After he partitioned his farm into R (1 <= R <= 200) rows and C (1 <= C <= 200) squares conveniently labeled 1,1 through R,C, Farmer John spent days cutting the hay and stacking a huge amount of it in square 1,1. He then undertook the task of mapping out the N (1 <= N <= 80,000) haypaths through the farm so that he could deduce the maximum rate he could move hay from square 1,1 to square R,C.

"Each haypath uniquely connects the middle of two rectilinearly adjacent partitioned squares and has some capacity limit L_i (1 <= L_i <= 20,000,000) that is the maximum amount of hay that can be transported in either direction across the haypath. He's just positive that he can move hay at a reasonable rate to the other side of the farm but he doesn't know what the fastest rate is. Help him learn it."

As a heritage from the days of holding our training camp in Wisconsin, USACO problems tend to concern cows, farms, and Farmer John's dilemmas. This

problem is challenging not only for its algorithmic difficulty but also because the time limit was 1.0 CPU seconds on a 700MHz processor used for automatic grading. Doesn't look that hard, does it?