Man Versus Machine:
The Silicon Graphics World Checkers Championship

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ABSTRACT

In August 1992, the first man versus machine world championship took place. The champion, Dr. Marion Tinsley, is arguably the greatest checkers player that ever lived. The challenger was the computer checkers program *Chinook*, a 3 year team effort from the University of Alberta. This article is an anecdotal recounting of the *Chinook*-Tinsley match for the World Checkers Championship, as seen from my point of view.

Preamble

Chinook earned the right to play for the World 3-Move Checkers Championship by coming second to the World Champion, Dr. Marion Tinsley, in the 1990 US Open (Tupelo, Mississippi). *Chinook* confirmed its position as one of the best players in the world with its close exhibition matches against Tinsley, Don Lafferty and Asa Long. There was considerable debate in the American Checker Federation (ACF) and English Draughts Association (EDA) as to whether machines should be allowed to play for human world championships. Eventually, Dr. Tinsley and I agreed to play the match, before the final decisions of the EDA and ACF. A contract was signed in October 1991 to play a 40-game match in August 1992, with David Levy, Raymond Keene and Tony Buzan doing the organization. In April 1992, Silicon Graphics International (SGI) agreed to sponsor the event.

Although considerable work had been done on *Chinook* since our initial 1990 success at Tupelo, this had not translated into improved program performance. After the match with Asa Long, we concluded that Tinsley could easily beat the current version of *Chinook* in a match. Norman Treloar, our checkers expert, had some new ideas on how to improve the way that *Chinook* assessed a position. This new version of *Chinook* played a test match against the old (Asa Long) version, winning 53.5% of the games. Although this was not significant, it showed us that there was room for improvements in *Chinook*'s checkers knowledge.

A new version of *Chinook*, with its checkers knowledge considerably revamped, made its first appearance in the Southern States Open (Gilbertsville, Kentucky) in July 1992. The program played very well throughout the event, defeating Lafferty and Lowder in matches. However, a lost match to Lafferty exposed some glaring problems in *Chinook*'s knowledge which had to be fixed. Nevertheless, we were encouraged by *Chinook*'s play, considering the major changes in the program that had never before been tested in tournament play.

Chinook next played in the US Open (Hot Springs, Arkansas) the week before the Tinsley match was to begin. To our surprise (and everyone else's I'm sure), the program lost its first 2 matches. However, these losses to Ed Markusic and Dr. Cravens proved to be instructive for us. In particular, the Cravens loss revealed a major error in the program that had been there for a long time. The error actually revealed itself in the Lafferty loss as well, but we did not realize it at the time. After fixing the error, the program won its next 5 matches and then drew with Richard Hallett in the last round to end up in a tie for second place. Although I was upset at losing games to these fine players, there is no doubt that the *Chinook* that played in rounds 3-8 was a different player than the *Chinook* of rounds 1 and 2. Had we not found this error, I am convinced that the match with Dr. Tinsley would have been no contest.

Over the past year, we made an enormous investment of effort in computing endgame databases. These databases consisted of billions of positions for which *Chinook* knew the final result (win, loss or draw). Thus, whenever the program's search reached a database position, it could look up the position and know its result with 100% confidence. Robert Lake did most of the work in building the databases. All endgames with 4 pieces against 3 (kings or checkers), the so-called 7-piece database, were completed (20 billion positions). Of the 111 billion 4 piece versus 4 piece endgames (8-piece database),

roughly 40% were completed in time for the match. All 4 by 4 endgames with 8, 7 and 6 kings on the board, and most of the 5 king endgames were completed. From a practical point of view, the most useful 8-piece endgame computed was 3 kings and a checker versus 2 kings and 2 checkers.

Chinook ran on a Silicon Graphics 4D/480 provided by the match sponsors. This machine contained 8 computers and had 256 megabytes of memory. Paul Lu wrote the software to have the computers cooperate, allowing the program to do more analysis in a given time. The net result was that *Chinook* could search up to 2 moves ahead further than it had in previous events.

We hid no secrets from Marion, telling him before the match about the databases and the Silicon Graphics computer. When told that the SGI machine would allow *Chinook* an extra 2 moves of search, Marion asked if that would help make the program a stronger player. When I replied affirmatively, Marion's immediate "Good!" responce seemed rather unsettling at the time. Why would he be happy about facing a stronger opponent?

Norman Treloar did a lot of work on the opening knowledge of the program. We extensively analyzed every opening, looking for possible mistakes that *Chinook* might make and adding knowledge to the program to prevent them. As well, we were always on the lookout for cooks. Several of our cooks arose in the match; many more lie waiting!

Chinook is a team effort. In addition to Norman, Paul, Robert and myself, the principal co-architects of the this version of *Chinook*, major contributions have been made by Joe Culberson, Duane Szafron, Brent Knight and Steve Sutphen. Of all the participants, the biggest contribution has been made by Norman Treloar. He designed *Chinook*'s checkers knowledge. Without his expertise, *Chinook* would not be as good a player today as it is. As well, Norman has painstakingly gone over *Chinook*'s opening book, looking for errors, finding cooks, and filling in gaps. This process is enormously time consuming.

The match was a best of 40 games. There was $10,000 in prize money at stake, split 60-40 to the winner. There was no formal set of rules for the match, other than we would follow the format of prvious world championship matches. Before the match, Marion and I came to a "gentleman's agreement" that we would work cooperatively to settle any problems that might arise.

What were our expectations before the match? Candidly, I expected to lose. My prematch prediction was a 4-0 or 5-1 victory for Tinsley, but privately I feared worse. Thanks to the problems revealed by the Cravens and Lafferty losses, *Chinook* performed far better than I had hoped for.

In the following, I often refer to the *depth* of *Chinook*'s searches. A search of depth 20, for example, means that the program considered all moves to a *minimum* of 20 moves ahead (a move is a play by one player; 20 moves ahead implies 10 moves by each player). Interesting moves can be searched considerably deeper; it is not uncommon for some lines to be analyzed 40 or more moves deep. *Chinook* assesses positions in terms of the value of a checker (100 points). The more positive the number, the better the position is for *Chinook*; the more negative, the worse. Usually, I start worrying when

Chinook is down 20 or more points. In practice, an advantage of half a checker, 50 points, is considered serious. If the advantage grows to 75 points, the game is probably over. It is important to note that *Chinook*'s assessments are based *not on the current position* but on the positions it is considering far in the future. Thus, a cursory glance at a position may suggest that it is even. *Chinook*'s assessment of an advantage means that far in the future (often 20 moves or more) it has found a sequence of moves to achieve the advantage.

Sunday, August 16

Norman Treloar and I arrived several days before the match. Norman visited friends, while I went off to SGI's office in Reading to install *Chinook* and test it out. On Saturday, the testing was complete and the SGI 4D/480 computer was shipped to London. That afternoon, I arrived in London. I had only been there a short time when I bumped into Marion Tinsley and we ended up taking an hour-long walk. Both of us were excited to be there. Internally, I was quite nervous about the match. If Marion had any reservations, he certainly didn't show it.

The match organizers did an outstanding job treating Marion as a VIP. He was picked up at the airport, stayed in a 5 star hotel, had a generous daily food allowance, and was given every courtesy possible. This treatment of champions is common in chess and unheard of in checkers. Marion was quite humble at the celebrity status he was accorded.

The match was held at the Park Lane Hotel. The Tudor Rose room would be the match venue. A spectator, on walking into the room, would see several rows of seats for viewing the match (complete with tap water, bottled water, a box of mints, paper and pencil). The front of the room had 3 distinct sections. To the left, on a 1-foot platform, was the table where the games would be played. This table was used in 1986 for the Kasparov-Karpov World Chess Championship. Besides the checker board, pieces and clock, a computer terminal was on the table for us to enter the moves to *Chinook*. Behind where we would sit was another SGI computer which was used to relay the game moves to a display for the audience to view.

In the center of the room was a large display showing the progress of the games. Angus Henderson, of SGI in Switzerland, developed a beautiful computer-generated checkers board, with realistic hands reaching out to make the moves. The hands turned out to be exact images of Angus' own hands. The audience was mesmerized as these hands realistically reached out, picked up and moved/removed checkers. Everyone was impressed.

To the right at the front was *Chinook*. The SGI 4D/480 looked like a refrigerator with blinking lights. I would input *Chinook*'s moves to a computer that would relay them across the room to *Chinook*. Only the front of the computer was visible; the rest was hidden behind a wall to reduce the noise.

Sunday evening featured the opening ceremony. Many dignitaries were present, including most of the top British chess players. Tony Buzan was the master of ceremonies, and Lord Brockett officially opened the match. We may have had a taste of things to come when Marion, in his opening speech, several times reiterated "I cannot

lose"!

Monday, August 17

Chinook - Tinsley
Game 1

Norm and I were apprehensive before the first game - we did not want to lose. Unfortunately, the way things transpired, we had plenty to worry about! Paul Lu arrived at the tournament hall shortly before the start of the game, fresh from an all-night plane ride from the US Open in Hot Springs.

10-15 23-18 06-10 18-14 09-18 24-19 15-24 22-06 01-10 28-19 11-15 27-24 08-11 25-22 11-16 26-23 05-09 *Chinook* was on its own now. Initially it thought the position was dead even. But when we reached depth 17, *Chinook* discovered that Tinsley had a big advantage. Now we began to worry. **22-17 16-20 31-27** Inadvertently, the game had now transposed back into our opening library. **04-08 17-13 08-11 13-06 02-09 29-25 11-16 21-17 07-11 17-13 09-14** Now we were on our own again, with a big advantage for Marion. **13-09 14-18** *Chinook* said we were in serious trouble. Previously, *Chinook* said Marion was 30 points better; now he was up 54 points. I confided in Paul that I was sure we were lost. **23-07 16-23 27-18 20-27 32-23 15-29 07-02 11-15** The assessment had improved to 30 points over the last few moves and wasn't changing. Thus, although *Chinook* said that Tinsley had the advantage, searching deeper said it could not find a way for him to make progress. Was it a draw!? **09-05 12-16 05-01 15-19 23-18 16-20 01-06 19-23** Whew! *Chinook*, looking ahead 21 moves, announced a draw; the program had found a line to force play into a drawn position in its endgame database for 3 kings and a checker versus 2 kings and 2 checkers. We were very pleased with this result. This endgame was the last to be computed and it was only 75% complete. Obviously, this work paid off and may have saved us this game. **06-10 20-24 10-15 24-27 02-06 27-31 06-10** We offered Marion 3 draws in this game, each of which he declined. Obviously he still felt he had chances to win. Marion had forgotten that we had this endgame database and could not lose this position. After the game, we made an agreement with him that all our draw offers would be made only if *Chinook* knew that the game was drawn. This would prevent Marion from wasting time on a game that *Chinook* knew he could not win. **31-26 18-14 26-22 14-09 22-17 09-06 23-27 15-19 27-32 19-24 32-28 24-19 28-32 19-24 32-28 24-19 28-32 19-24 32-28 24-19 28-32 19-24 32-28 24-19 28-32 19-23 32-28 23-19 28-32 06-01 32-27 01-05 17-13 19-16 27-24 10-15 24-28 16-19 28-32 19-23 32-28 15-19 28-32 19-24 03-07 24-27 07-10 Drawn** A bit too close for comfort.

Tinsley - Chinook
Game 2

10-15 23-18 06-10 18-14 09-18 24-19 15-24 22-06 01-10 28-19 11-15 27-24 08-11 31-27 This cook surprised a lot of people. Experts in the audience labeled this an "ugly" move; some had the opinion that this move and its follow-up gave *Chinook* a bad game. A

well-known player even said we were lost! Marion did not share this assessment. **05-09 25-22 09-13 27-23** I am told that this was quite strong and forced Marion to find some good moves. *Chinook* said it was up 44 points. Unfortunately, this was the high point of the game for us; the advantage slowly dissipated move by move. **11-16 21-17 07-11** After the game, Tinsley said that this was the only move to avoid losing. **17-14 10-17 19-10 11-15 29-25 17-21 23-18 03-08 18-11 08-15 24-20** *Chinook* now announced that the game was a draw. So why do we keep playing? If *Chinook* has seen to the end of the game and knows it is a draw, then it will not make a mistake and lose the game. On the other hand, there is a slim chance that Marion might make a mistake and lose. Thus, as long as *Chinook* thinks it still has some advantage, it will continue to play. **16-19 20-16 19-24 16-11 12-16 11-08 04-11 10-07 02-06 07-02 06-09 02-07 09-14 07-10 15-18 22-08 16-20 10-17 13-31 25-22 24-27 32-23 Drawn**

Near the end of the match, I asked Richard Pask what he though the best game of the match was. To my surprise, he said it was game 2. Why? Because *Chinook* played an original opening idea, followed it up strongly, and forced Marion to find some strong defensive moves. Even though we did not win this game, we were happy with *Chinook*'s play. If nothing else, it showed Marion that he was facing a dangerous opponent.

During the first day of play, Marion and I were besieged by the media. This caused delays in starting games 1 and 2. As well, game 1 took over 5 hours to complete. Consequently, we decided to postpone the next 2 games until the rest day on Wednesday.

SCORE: Tinsley 1 : 1 Chinook

Tuesday, August 18

Tinsley - Chinook
Game 3

10-15 23-18 11-16 18-11 08-15 22-18 15-22 25-18 16-20 24-19 04-08 29-25 09-14 18-09 05-14 27-23 08-11 25-22 06-10 22-18 14-17 21-14 10-17 31-27 01-06 18-15 Announcing a draw. **11-18 23-14 07-11 26-23 17-22 23-18 06-10 14-07 03-10 19-15 10-19 27-24 20-27 32-07 Drawn** A quiet game. *Chinook* said it was better throughout, but there was never enough to cause Marion any problems.

Chinook - Tinsley
Game 4

10-15 23-18 11-16 18-11 08-15 22-18 15-22 25-18 16-20 24-19 04-08 29-25 09-14 18-09 05-14 27-23 08-11 25-22 06-10 22-18 14-17 21-14 10-17 19-15 03-08 15-10 07-14 18-09 01-05 In the previous game, *Chinook* considered a similar sacrifice, but rejected it because it could see that Tinsley could draw. **09-06 02-09 23-19 17-21** After the game, people questioned this move and labeled it a mistake, preferring 20-24 instead. The controversy is irrelevant. *Chinook* had announced the game drawn on the previous move.

Given two lines which both lead to draws, *Chinook* is programmed to choose the one that, in its estimation, offers the opponent the most chances to go wrong. Thus, 17-21 was preferred over 20-24. **26-22 09-13 32-27 05-09 22-18 11-16 19-15 16-19 27-23 19-26 31-22 12-16 15-10 16-19 10-06 19-23 06-01 23-26 30-23 21-25 01-05 25-30 05-14 Drawn**

This was a quiet game from our point of view. However, some members of the audience thought we had been in serious trouble. Many times in the match, it was obvious that the audience (which included some well-known strong players) did not understand what was transpiring on the board.

Tinsley - Chinook
Game 5

11-15 21-17 08-11 17-13 04-08 23-19 15-18 22-15 11-18 25-21 09-14 This line came from Richard Fortman's Basic Checkers and is considered weak. Obviously, we did not realize it at the time we added this to *Chinook*. Although published material is usually correct, depending on the source, there are enough mistakes in print that we have to be careful about what information we choose to use. **29-25 14-17 21-14 10-17 24-20 17-21 26-23 06-10** Now we realized we were in trouble. *Chinook* is down 33 points. **23-14 10-17 27-24** *Chinook* expected 27-23, thinking it was stronger. Now, we are searching to depth 21 and are only down 15 points. **01-06 32-27 08-11 27-23** Here we expected 19-16 and the score dropped to -43. It was a big relief when Marion chose 27-23 instead. Now we are only down 18 points. **06-10 31-26 11-15 25-22 07-11 19-16 12-19 23-07 02-11 13-09 05-14 22-13 15-18** Suddenly, we are only down 3 points! It must be a draw! Not being a checkers player, I live and die on these assessments. **13-09 14-17 09-06 18-22 26-23 22-26 23-18 10-15** *Chinook* announced a draw. When *Chinook* first announces a draw, it is not guaranteed to be correct. If it searches deeper and the assessment still holds, then it is usually correct. I use the rule of thumb that the first draw announcement is correct 65% of the time, the second one 95%, and the third 99%. In fact, 10-15 is a mistake. *Chinook* said 26-31 was also a draw, but an "easier" draw for Tinsley than 10-15. With a few more minutes of contemplation on this position, *Chinook* discovers that 10-15 is not good and that 26-31 does indeed draw. This illustrates the point that running a checkers program on a faster computer improves the program's play. If *Chinook* were running on a computer that was twice as fast, *Chinook* would have drawn this game. Of course, this point is silly, since all mistakes can be ultimately corrected by searching deeper. The rest of the game is uninteresting; Marion makes it look easy. **30-23 15-22 06-02 22-26 23-19 26-31 02-06 03-07 06-02 31-26 19-16 26-23 16-12 23-18 12-08 18-14 08-04 17-22 24-19 21-25 02-06 14-17 06-02** Marion wants to get to the next time control. Unfortunately, three-fold repetitions of a position are not draws as in chess. **17-14 02-06 14-17 06-02 17-14 02-06 14-17 06-02 17-14 02-06 14-17 19-16 25-30 04-08 11-15 08-11 15-19 11-02** After the game, everyone asked why we continued to play, since the game is "obviously" lost. What is obvious to you may not be obvious to *Chinook*. Our endgame databases are full of surprises. For example, they contain many positions that are "obviously" drawn, but turn out to be long and involved wins. In this case, there may be some hidden drawing resources that the database knew about that was not apparent to the audience. We played on in until it was clear that there would be no database miracles. **19-23**

16-12 30-26 28-24 22-25 12-08 25-30 08-03 23-27 24-19 30-25 03-07 27-32 19-16 26-23 16-12 32-28 12-08 23-19 08-03 19-24 Tinsley Wins A well played game by Tinsley.

After the game, we realized that *Chinook*'s understanding of "loose men", checkers that were vulnerable to an attack from a king from behind (such as the checker on 11), was inadequate. That evening, we discussed what knowledge we might add to the program to fix this deficiency.

Tinsley - Chinook
Game 6

11-15 21-17 08-11 17-13 09-14 25-21 11-16 24-19 15-24 28-19 04-08 22-18 08-11 18-09 05-14 29-25 11-15 25-22 15-24 27-11 07-16 22-18 01-05 18-09 05-14 26-22 16-19 23-16 12-19 22-17 03-08 32-27 Drawn The first rest game of the match.

The media was everywhere! The British press had daily coverage of the match. Some newspapers even printed the occasional game! We gave countless radio interviews and numerous television appearances. The president of Silicon Graphics International, Bob Bishop, was driving home from work in Geneva when he heard Marion and I being interviewed on BBC International radio. Surprisingly, the American media largely ignored the match.

Marion was quoted as saying that "*Chinook* was programmed by Jonathan, but I am programmed by God". This brought out the philosophical side of some reporters. Some argued for technological advances; others believed in the indomitable human spirit.

The media called this match a clash between man and machine. They were right, but they had it backwards. Marion played checkers with perfect logic and an infallible memory, rarely making mistakes. *Chinook* played like a young arrogant master that was still maturing, occasionally making the type of mistakes that Marion might have made when he was a youth. I would argue that Marion was more a machine than *Chinook*, and *Chinook* was playing more human-like than Marion!

SCORE: Tinsley 3.5 : 2.5 Chinook

Wednesday, August 19

Tinsley - Chinook
Game 7

11-15 23-18 10-14 18-11 08-15 26-23 06-10 22-18 15-22 25-18 04-08 24-19 08-11 28-24 Universally condemned as weak. **02-06 30-26 14-17 21-14 10-17 19-15 03-08 23-19 09-13 26-22 17-26 31-22 11-16 27-23 16-20 15-10 20-27 10-03** *Chinook* is quite happy. All along it thought it had the better position. I may not be a good checker player, but even I realized the inherent danger in our position. I could not help but think that the new knowledge that we were working on for loose men might have made a difference here, if only we had it ready for this game. **08-11 03-07 11-16 07-11 16-20 11-07 27-31**

29-25 31-27 07-03 27-31 03-07 20-24 25-21 Now *Chinook* conceded a small advantage to Tinsley. **31-27 32-28 06-09 07-10** Things are getting worse: a 30 point disadvantage. **27-31 19-15 24-27 15-11 27-32 23-19 32-27 19-15** *Chinook* went into "panic mode" here. Everywhere it looked, it saw bad things happening. Eventually it decided to play 19-15, realizing it was going to lose a checker. *Chinook* is lost. **12-16** ??? Marion does not see it! Now the game is a draw. After the game I asked Marion about this position. Of course he considered 27-23 but he maintained it was still a draw. The next morning he conceded that he was wrong: 27-23 was a win. I do not know what he missed in his analysis. **11-07 16-19 07-02 19-23 15-11 23-26 10-14 26-30 11-08 30-25 02-07 27-23 08-03 23-19 14-10 19-23 10-14 23-19 14-10 19-23 10-14 Drawn** *Chinook* has built a fortress that Tinsley cannot break.

The same problem arose in this game in as in game 5: *Chinook* did not properly understand how dangerous it was to have Tinsley's kings behind the checkers. That evening, we experimented with some new knowledge in *Chinook* to try and overcome this problem.

Tinsley was dominating the match. He obtained a strong position against us in game 1, defeated us in game 5, and missed a win in game 7. We were quite disheartened.

Chinook - Tinsley
Game 8

Marion did not let the disappointment of the previous game bother him and went out to lunch with the *Chinook* team. This is indicative of the friendly atmosphere that prevailed.

11-15 23-18 10-14 18-11 08-15 22-17 14-18 This move caught everyone by surprise. Marion was mad at himself after the game for allowing these complications. **24-19 15-24 28-19 07-11 17-14 11-16 19-15 04-08 21-17 16-19 17-13 12-16** At this point I breached the rules of etiquette and broke out laughing. Both Marion and Norman gave me a strange look. I saw *Chinook* was planning 16-20 in some lines, creating the unusual (and humorous to me) formation of 3 black men behind 3 white men. I knew the position was complicated and that is when I had my first inkling that we might be in for something special. *Chinook* says Tinsley has a small advantage. **25-21** *Chinook* predicted 26-22 with advantage to White. After the game Marion demonstrated that 26-22 was markedly superior to 25-21. Marion explained his move choice by stating that the position was complicated, and 25-21 appeared to simplify things. Now *Chinook*'s assessment of the position grows from move to move. **18-22** Depth 19 shows a 20 point advantage. **26-17 09-18 29-25 16-20** A depth 21 search increases the advantage to 35 points. **17-14 02-07 21-17 19-24** This move surprised everyone in the audience. At first I was horrified; doesn't white win a checker after 32-28? It took me quite a while to see 18-23. **30-26 07-10** Depth 21 says we are up 51 points. Was Marion teasing us? On several occasions in the past, *Chinook* thought it was close to a win against Tinsley (for example, being up 44 points in Game 2), only for the program to search a bit deeper and discover it was a draw after all. Were we in for another let down? **14-07 03-19 27-23 18-27 32-16 24-27** Now it was clear; *Chinook* is up an insurmountable 81 points. The program knows it is

winning a checker with no compensation for white. **31-24 20-27 26-22 08-12 16-11** At this point, *Chinook* announced it had seen to the end of the game and announced a win. Even though I knew it was coming, I was stunned. Norman Treloar, who often sat beside me on stage, today was in the audience watching. Paul Lu, who was monitoring the computer, saw that *Chinook* had stopped calculating. He thought that the program had died or the machine had crashed. No one in the audience had an inkling what was about to happen. **27-31 11-07 31-26 25-21 26-30 22-18 30-26 18-14 26-22 Chinook Wins** Marion resigned. When we shook hands, most of the audience thought we were agreeing to a draw.

Since it has happened so rarely, and few have ever witnessed it, let me describe what Marion does when he loses. He offered his resignation as he extended his hand in congratulations. After a few perfunctory remarks, we immediately started analyzing the game, zeroing in on the critical 25-21 move. He showed no signs of being upset. Coming from the world of chess, I can attest that there are many champions who do not lose so graciously. Marion is a sportsman and a gentleman in the finest sense of the word.

After the game, Paul, Norm and I went out to celebrate. What does one do after achieving a long-sought-after goal? I have often fantasized about the exhilaration I would feel when I finally defeated the Terrible Tinsley. However, anyone watching us at dinner that night would have thought we came from a funeral. How can I explain the sadness that I felt? Perhaps we were sad for Marion. Not only did we all have a lot of respect for him, but we liked him as a person. Perhaps we were sad because this game marked a changing of the guard. After all, we were still members of the human race, and *Chinook* defeating Tinsley in a single game meant that it may only be a matter of time before computers would be supreme in checkers. I still don't know the answer. But I learned a lot about myself in trying to find it.

SCORE: Tinsley 4 : 4 Chinook

Thursday, August 20

The media was not to be seen. We thought our win yesterday would be big news. After all, how often does Marion lose?

Chinook - Tinsley
Game 9

10-14 24-20 11-16 20-11 08-15 22-18 15-22 25-18 04-08 28-24 08-11 29-25 06-10 25-22 01-06 24-19 11-16 32-28 16-20 *Chinook* announces a draw. **27-24 20-27 31-24 09-13 18-09 05-14 24-20 14-17 21-14 10-17 23-18 07-11 18-14 06-10 14-07 03-10 Drawn** An uneventful game.

Tinsley - Chinook
Game 10

10-14 24-20 11-16 20-11 08-15 22-18 15-22 25-18 04-08 28-24 08-11 29-25 06-10 25-22 01-06 24-20 11-16 20-11 07-16 27-24 16-19 24-15 10-19 23-16 12-19 26-23 19-26 30-23 06-10 31-26 02-07 18-15 10-19 23-16 09-13 32-28 Drawn

Tinsley - Chinook
Game 11

11-16 24-20 16-19 23-16 12-19 22-18 09-14 18-09 05-14 25-22 10-15 22-17 06-10 29-25 08-11 17-13 04-08 25-22 02-06 22-17 08-12 27-24 Drawn Unfortunately, this game came to a premature end.

Silicon Graphics had provided an impressive graphical display for showing the progress of the game to the audience. It was a separate program from *Chinook*, meaning that every time *Chinook* or Marion made a move, I had to type the move into the display program so that the audience could see it. This was unsatisfactory, since occasionally I forgot to enter the move(s). Before this game, I was given an interface to the display program to add to *Chinook*. Now when *Chinook* made a move, it would automatically update the graphical display. We had 5 minutes before the game started, so we did a quick test and it seemed to work.

At this point, *Chinook* ended the game. The graphics display encountered an error in displaying a move and exited the program, taking *Chinook* with it. In this position, *Chinook* had searched 19 moves deep and was going to play 32-27. We switched to a backup machine to continue the game, but when given this position, the backup machine only had time to search 17 moves deep and wanted to play 17-14.

We were faced with a dilemma. *Chinook* died through no fault of our own. Which move should we play? I was reluctant to play 17-14 since it had only been searched 17 moves deep. On the other hand, we could not play 32-27 since the backup version chose the other move. What if one move was a loser? What if the other was a winner? *Chinook* should not be penalized for an error that was beyond our control. This philosophy had been agreed to before the match.

Here is an illustration of the philosophy that the program should not be penalized for problems beyond its control. If a power outage had occurred, *Chinook* would have been unable to continue the game. Should it forfeit? If Dr. Tinsley had a heart attack, should he forfeit? Marion and I had a gentleman's agreement that neither side would be penalized for events that affected the result of a game that were not checker related. The problem with the graphics program was not *Chinook*'s fault and we felt the program should not be penalized because of the graphics display.

Fortunately, a simple compromise was worked out. We agreed to offer a draw in game 11, if Marion would agree to a draw in game 12. Although this solved this problem, no one was satisfied. Unfortunately, we did not know at the time that the move choice was academic - both are published play draws. As far as I was concerned, we had essentially lost the opportunity to play 2 games against the greatest checker player ever.

For the rest of the match, we entered the moves to the graphics display manually.

Tinsley - Chinook
Game 12

Drawn

SCORE: Tinsley 6 : 6 Chinook

Friday, August 21

During the night, we ran some experiments on the new knowledge for "loose men". The experiments showed that the addition did not hurt the program, but it was not clear that it helped either. Fearing a repeat of games 5 and 7, we decided to add this new knowledge to *Chinook* for the rest of the match. This may have been a fateful decision, because in game 14 the conditions arose where this knowledge could be useful.

Chinook - Tinsley
Game 13

12-16 21-17 09-14 17-13 16-19 24-15 10-19 23-16 11-20 26-23 08-11 22-18 07-10 18-09 05-14 25-22 04-08 29-25 14-17 31-26 10-15 25-21 01-05 21-14 06-09 13-06 *Chinook* is now out of its opening knowledge, but sees to the end of the game and announces a draw. **02-25 30-21 11-16 21-17 08-12 17-14 03-07 26-22 15-19 23-18 07-11 28-24 19-28 22-17 11-15 18-11 16-19 Drawn**

Tinsley - Chinook
Game 14

12-16 21-17 09-14 17-13 16-19 24-15 10-19 23-16 11-20 26-23 08-11 22-18 07-10 18-09 05-14 25-22 04-08 22-18 *Chinook* comes out of the opening with a 7 point advantage. **14-17 31-26** Searching a bit deeper shows a 17 point advantage. **10-15 18-14 08-12 28-24** A depth 19 search said that the position is even. Here, *Chinook* says 06-10 is one way to draw. **12-16** You can imagine the shock on my face when *Chinook* reported it was up 47 points. Obviously, 12-16 is a mistake but the win is far from easy. **29-25 17-21 14-09** A 68 point advantage. Black is going to start running out of moves and be forced into accepting white's sacrifice. When a score becomes this big, the win is usually easily achieved. To Marion's credit, he put up the best defense possible. At several points in the game, *Chinook* wavered and thought that the win was gone. **03-08 09-05 06-10 13-09 01-06 05-01** We owe our success in this game to Lafferty and Cravens. Our losses to them showed we had a major flaw in how we assessed man-down positions. Marion had confided to me that these type of positions seemed to be a weakness of the program. After the game, he had to change his assessment! **06-13 01-05 02-07 05-01** Was it a win? Our position looked so strong, but a depth 23 search said *Chinook* was only up 37 points. Once again, it looked the early high score would be an illusion. Originally, the program was going to play 25-22 with a 53 point advantage. But at depth 21,

the score dropped to 30 points and 05-01 emerged as best. At the time, I thought this was a mistake. This was the last move before time control for Tinsley. *Chinook* said that after 25-22, the piece had to be returned with 21-25. I (naively) thought this might be difficult for Tinsley to find with the few minutes he had remaining on the clock. After the game, he told me 25-22 draws! Am I exposing my inadequate playing abilities? **08-12 32-28 10-14 01-06 15-18 06-10 11-15 10-03 16-19 23-16 12-19 03-07 14-17 26-22** At this point, *Chinook*'s analysis showed why the score had been low over the past few moves: it saw it was winning a checker, but thought Black could achieve a man-down draw (as did most of the audience). With a depth 23 search, *Chinook* found its way into the databases and saw it was a win. **17-26 30-16 21-30 07-10 18-22 10-19 22-26 16-11 26-31 11-07 30-25 19-23 25-22 07-03 22-17 23-18 Chinook Wins** Several experienced masters rushed up to the table to congratulate Marion on a beautiful man-down draw!

Some people considered *Chinook*'s victory in game 8 lucky - Marion missed 26-22. However, a second win left no doubt as to *Chinook*'s abilities. *Chinook* played well and earned a fine victory. Some pointed to Marion's 12-16 and said we were lucky. You cannot win a game unless the opponent makes a mistake. The trick is in creating a position where there is more opportunity for the opponent to go wrong. This is exactly what *Chinook* did, and Marion made a mistake. I will always wonder, though, did the knowledge we added to *Chinook* before game 13 make any difference in this game?

What do you do after winning a second time against Marion? Norman, who strongly sympathized with Marion's plight, went back to his hotel. This time Paul and I really celebrated. The sadness of game 8 had been replaced with a euphoria. Dare we consider the impossible? Could we win the match?

Tinsley - Chinook
Game 15

09-14 22-18 05-09 25-22 11-16 18-15 10-19 24-15 07-10 27-24 10-19 24-15 02-07 31-27 08-11 15-08 04-11 22-17 09-13 17-10 06-15 29-25 01-06 25-22 06-10 21-17 16-19 23-16 12-19 27-23 *Chinook*'s slight pull in the game now gives way to a draw. **19-24 28-19 15-24 23-18 10-15 30-25 03-08 25-21 08-12 18-14 15-18 22-08 Drawn**

Chinook - Tinsley
Game 16

09-14 22-18 05-09 24-20 10-15 28-24 15-22 26-10 07-14 25-22 01-05 22-17 14-18 23-14 09-18 30-26 11-15 *Chinook*'s score jumped being down 4 to up 16 points. **26-22 18-25 29-22 03-07** And now the score dropped back to -4. When we have some time, we will examine these last few moves to find out what caused the 16 point "mirage". **27-23 08-11 23-19 06-10 31-27** We were predicting 17-14 with an even game. Now the score jumps again to a 13 point advantage. Marion has no trouble drawing this game. *Chinook* plays it out hoping for a mistake. **05-09 17-13 09-14 13-09 14-18 21-17 18-25 17-14 10-17 19-03 11-15 27-23 25-30 32-28 30-26 23-19 15-18 03-08 04-11 19-16 12-19 24-08 18-23 Drawn**

SCORE: Tinsley 7.5 : 8.5 Chinook

Saturday, August 22

While walking to breakfast with Paul that morning, I remarked that everything had gone almost perfectly for us. When was the bubble going to burst? Unfortunately, these innocent remarks turned out to be prophetic...

On entering the playing hall this morning, we immediately noticed how uncomfortably hot it was. It turned out that hotel management had turned off the air conditioning in the room and left the lights on all night, instead of leaving the air conditioning on and the lights off. Computers and lights can generate a lot of heat, especially in a locked room with no ventilation. I am not exaggerating when I state that the room temperature was well over 80 degrees (F). An embarrassed hotel staff hastily did all they could to cool down the room, but it would take quite a while to reach a comfortable level.

Chinook - Tinsley
Game 17

09-13 23-19 06-09 27-23 11-15 22-18 15-22 25-18 08-11 19-15 10-19 24-08 04-11 31-27 02-06 29-25 06-10 18-14 09-18 23-14 10-17 21-14 01-06 27-23 It was still uncomfortably hot on stage. At this point the game was stopped for over an hour while we tried to cool down the room. Part of the solution involved putting a fan on stage beside the checker board, blowing into Marion's face from a distance of 4 feet. **06-09 23-18 07-10** Announcing a draw. **14-07 03-10 28-24 10-15 25-22 12-16 26-23 09-14 18-09 05-14 32-28 14-17 Drawn** It is easy to draw games like this when you are leading.

Tinsley - Chinook
Game 18

09-13 23-19 06-09 27-23 09-14 22-18 11-15 18-09 05-14 25-22 07-11 30-25 01-05 22-17 13-22 25-09 *Chinook* comes out of the opening with what it thinks is a sizable advantage (31 points). **05-14 26-22 11-16 24-20** Marion is teasing us again - up 54 points. **15-24 20-11 08-15 28-19 15-24 22-18 12-16 18-09 16-20 23-19 10-14 31-26** *Chinook* sees a 69 point advantage! **14-18 26-22** On this search, *Chinook* finally sees the truth and the score drops to 33. In fact, this is all published play and black can draw. **Chinook Forfeits**

Its been well over a month since this game was played, and it still brings back painful memories. *Chinook* had made its first 16 moves in 27 minutes, meaning it had 33 minutes left on the clock to play its last 4 moves. *Chinook* didn't move. I sat on the stage for 33 minutes waiting for move 17. The first 15 minutes were easy, since I expected the program to spend that long on this move. A message finally appeared on the screen saying *Chinook* was going to make its move in 95 seconds. 2 minutes went by. Then 5. Where was the move? I became quite agitated, knowing something was wrong, but helpless to do anything. By a strange coincidence, Rob Lake, our database man, arrived at the tournament site at this moment, coming straight from the airport.

With 5 minutes left on our clock, I talked to Paul to see if he had any idea what was wrong. With only 2 minutes left, we forced the program to move to see if it was alive. We then stopped the clock and asked for a meeting with the organizers and Marion.

We had never seen this behavior before in the program. The program has an internal clock which monitors how much time it has left on the clock. When the time gets short, an alarm goes off and forces the program to move. Why hadn't it occurred? The immediate suspicion was the heat. Had the SGI 4D/480 been affected by sitting in a hot room all night? We had no way of knowing whether the problem was with the machine or our program. If the problem was with the machine, then we should not be penalized because of an error on the hotel management's part. However, if the problem was with *Chinook*, then we should resign.

During the meeting, it was agreed to allow *Chinook* to continue the game on a backup machine. However, after Norm, Paul and I consulted we decided it would be in the best interests of sportsmanship if we resigned.

I am sure you will have no difficulty visualizing the shock that I felt by having to resign a drawn game in a World Championship match. Afterwards we tried to rationalize it, saying that this evened out Marion's missed win in game 7. The passage of time, however, has not diminished the vivid memory of this horrible afternoon.

Tinsley - Chinook
Game 19

Since there was not enough time to try and diagnose our mysterious problem, we agreed with the organizers and Marion that if it happened again, we would be allowed to switch to a backup machine. Since we had never seen the problem before, we were sure it was rare and probably would not happen again.

11-16 21-17 09-13 25-21 05-09 23-18 10-15 18-11 08-15 24-19 16-23 27-11 07-16 30-25 03-07 17-14 09-18 22-15 07-11 15-08 04-11 21-17 13-22 25-18 06-10 29-25 01-05 28-24 10-14 18-09 05-14 26-22 11-15 25-21 14-18 24-20 Drawn A quiet draw. It did not matter - I was still shell-shocked.

Chinook - Tinsley
Game 20

11-16 21-17 09-13 25-21 05-09 23-18 10-15 18-11 08-15 24-19 Drawn

At this point, the mysterious problem from game 18 struck again. We were in the process of switching to a backup machine when Marion offered us a draw, which we gladly accepted. This gave Marion a chance to end the evening early and us a chance to start work on tracking down our problem.

In retrospect, this was the turning point in the match. Had game 18 ended in a draw, Marion would have been forced to take chances in the second half of the match to try and equalize the score. Suddenly, he gets a free point and the match is all even. Whereas we

spent the entire weekend trying to find our problem, Marion spent the weekend going to church and resting. The Marion Tinsley that sat down at the board Monday morning was a different man than the one who played us today.

SCORE: Tinsley 10 : 10 Chinook

Monday, August 24

We spent almost every hour of the weekend working on our mysterious problem, but were unable to recreate it. We wrote a program that simulated the conditions at the time the problem occurred and ran it all weekend: nothing. We poured through our program listings grasping at straws: nothing. Finally, we decided to concentrate on an anomaly we had seen earlier in the week. Maybe that problem was related to our forfeit.

We spent Sunday tracking the anomaly and finally solved it. Unfortunately, it was not related to our forfeit problem. However, it pointed out a serious efficiency error in *Chinook*. This error could slow the program down as much as 3-fold in some positions. This was a hard problem to find, since it only affected the speed of the program, not the correctness of the moves it chose. When Monday morning rolled around, we were no closer to the truth of the forfeit problem but, ironically, we had a stronger version of *Chinook* to renew the battle with Dr. Tinsley.

Chinook - Tinsley
Game 21

10-14 22-18 11-15 18-11 08-15 24-19 15-24 28-19 06-10 25-22 04-08 22-18 08-11 27-24 09-13 18-09 05-14 24-20 02-06 29-25 10-15 19-10 06-15 25-22 15-19 23-16 12-19 26-23 19-26 30-23 01-06 Although *Chinook* is going to temporarily win a checker, it has no illusions about the result. **22-18 06-09 31-26 03-08 32-27 07-10 27-24 10-15 26-22 08-12 23-19 14-23 19-10 23-26 Drawn**

Tinsley - Chinook
Game 22

10-14 22-18 11-15 18-11 08-15 26-22 06-10 22-17 Our mysterious bug appeared again! After a whole weekend of testing, nothing shows up. Why does it only show up in tournament games? We stopped the program so we could look at it later and switched to a backup. The remainder of the game was played on a single computer. **04-08 23-19 08-11 17-13 01-06 25-22 14-17 21-14 09-25 29-22 05-09 27-23 09-14 31-26 14-17 24-20 15-24 28-19 11-15 32-28 15-24 28-19 07-11 22-18 03-07 19-16 12-19 23-16 06-09** Here *Chinook* expected 10-15, knowing that it draws. Instead, *Chinook* thinks 06-09 is a mistake - the score climbs to 52. At this point, the program is searching 21 moves ahead and it can see a clear draw for 10-15 and lots of trouble for 06-09. **13-06 02-09 16-12 17-21 12-08 10-15 26-22 07-10 08-03** Only now does the assessment begin to drop. **10-14 03-07 14-23 07-16 15-19 16-11 19-24 11-15** And now, *Chinook* proves the game is

drawn. Once again, Marion unwittingly plays havoc with my emotions! **23-27 22-17 09-13 Drawn**

During the break between games, we spent our time looking at the crippled version of *Chinook*. Examining the state of the program suggested a possible cause for the program stopping. Although we could not prove that this was really the problem, we added extra code to the program to prevent this scenario from happening again. Whether this was the problem or not, our mysterious bug has not appeared again.

The problem may be a software error in the interface to the I/O of the machine. On a single computer, if you execute a command to print, it prints. On a parallel machine, like the SGI 4D/480, it is more complicated. If 2 or more of the computers decide to print more-or-less simultaneously, then the output becomes interleaved and garbled. We believe it is possible that the I/O system on the machine allows only one computer to print at a time - the others have to wait their turn. When *Chinook* is supposed to move, an alarm goes off, the program immediately stops what it is doing, and then prints out what its move is. But what if that computer was in the middle of doing a print when the alarm went off? A deadlock scenario might arise. *Chinook* wants to print its move, but cannot because the previous print has not completed.

If this theory is correct, then it is hard to understand why the error appeared in games 18, 20 and 22. The same software running on the same machine was used to compete in the US Southern States (32 games), the US Open (32 games), a practice match against the program Colossus (20 games), and the Tinsley match (the first 17 games). Why this problem did not occur previously and only manifested itself here remains a mystery.

Tinsley - Chinook
Game 23

11-15 24-19 15-24 28-19 08-11 22-18 11-16 25-22 16-20 22-17 04-08 17-13 08-11 26-22 09-14 18-09 05-14 22-18 01-05 18-09 05-14 30-26 *Chinook* is now on its own and thinks it is down 31 points. Time to start worrying again. **11-15 19-16 12-19 23-16 14-17 21-14 10-17 29-25 07-10 25-22** Accidentally, the game has transposed back into lines that *Chinook* knows. **17-21 26-23** But now we are back on our own again, down 36 points. **21-25 23-18 15-19 22-17 25-29 18-14 29-25 14-07 03-10 16-11** Over the past few moves, the pessimistic assessment of the position has slowly improved move by move, until now *Chinook* thinks the position is even. **25-22** After the game, Marion was noticeably upset and said he missed a win. At this point, he thought 10-15 was the star move. *Chinook* thought otherwise and demonstrated a shot that refuted Marion's intended play. Marion was quite relieved knowing that there was no win! **11-08 19-23 27-18 22-15 31-26** *Chinook* announces the draw. **15-19 08-03 10-15 17-14 15-18 14-09 06-10 09-06 02-09 13-06 10-14 03-07 Drawn**

Chinook - Tinsley
Game 24

11-15 24-19 15-24 28-19 08-11 22-18 11-16 25-22 16-20 22-17 04-08 17-13 08-11 26-22 09-14 18-09 05-14 22-18 01-05 18-09 05-14 30-26 11-15 32-28 15-24 28-19 07-11 Announcing the draw. **19-16 12-19 23-07 02-11 29-25 11-15 26-23 03-07 27-24 20-27 31-24 15-18 23-19 14-17 Drawn**

After the fireworks of the previous week, today's games were rather tame. We had the feeling that Marion, having been burned twice, would not take any more risks and wait for the program to make a mistake. If that was his strategy, he did not have to wait long.

SCORE: Tinsley 12 : 12 Chinook

Tuesday, August 25

Chinook - Tinsley
Game 25

09-13 23-18 11-15 18-11 08-15 24-20 07-11 28-24 A tragedy for us. *Chinook* knows this opening, but only when white plays the move sequence 27-23 and then 28-24. After 28-24, *Chinook* is on its own. If it had found the correct 05-09 and Tinsley replied with 27-23, then *Chinook* would have been back in its opening knowledge. Seeing this position for the first time, *Chinook* comes up with a weak defense. Searching 19 moves ahead, it sees only a 10 point disadvantage. **04-08 27-23 05-09 32-28 01-05 22-18 15-22 25-18 10-15 26-22 06-10** This is the critical position. Up until now, *Chinook* said it was down only 12 points, and was going to play the correct 09-14. But searching at depth 23, the program found that 09-14 led to serious trouble; the program would be down more than half a checker. *Chinook* switched to panic mode, searching for a viable alternative. 06-10 seemed to be better at -23, but when we reached depth 23, its score plummeted to -56. *Chinook* spent 11 minutes on this move and were unable to find anything better. 09-14 is supposedly correct, but it appears to be a very narrow draw (if it exists at all). According to Marion, the game is now over. **30-26 09-14 18-09 05-14 23-19 14-18 22-17 13-22 26-17 12-16** This move stunned the audience. *Chinook* throws away a checker, or so it seems. After the game, Marion showed a beautiful, long variation in which *Chinook* would lose. Rather than wait for the guillotine to fall, *Chinook* decides that with this move, it can achieve "some" counterplay. This points out a serious weakness in our approach to programming *Chinook*. Obviously, after 12-16, the game is over and Marion wins handily. Instead 18-23 would force Marion to demonstrate that he had found the long winning variation. In other words, we assume our opponent is capable of seeing everything we can, and this can be a bad assumption (especially against a weaker opponent). Of course, Marion sees everything, so giving him the checker now or later is academic. **19-12 18-22 31-27 22-26** This was the high-point of our counter-play. The -38 score did not last long, and it rapidly plummets until we finally resign. **27-23 26-31 23-19 31-27 17-14 10-17 19-10 17-22 10-07 03-10 12-03 11-15 24-19 15-24 28-19 10-14 19-16 02-06 16-11 14-18 Tinsley Wins** As usual, give Marion a chance and he takes everything he can get. Beautiful play on the part of the champion.

Tinsley - Chinook
Game 26

09-13 23-18 11-15 18-11 08-15 24-20 03-08 27-23 08-11 28-24 04-08 23-18 05-09 32-28 01-05 26-23 15-19 23-16 Here we go again; *Chinook* thinks it is up 53 points. **12-19 24-15 10-19 30-26 07-10 18-15 11-18 22-15 09-14 20-16** Only now, does it downgrade the assessment to a disheartening 18 points. I wanted so badly to even the score. Obviously, Marion can out-search us in some positions. **14-18 16-11 18-23 11-04 23-30 04-08 10-14 15-11 14-17 21-14 30-21 08-12** Everyone thought Tinsley was in trouble. Why didn't *Chinook* play 31-27 21-17 27-24 17-10 24-15 10-19 11-07 02-11 08-24? The resulting endgame of 6 pieces is in *Chinook*'s database and it is a (narrow) draw. So *Chinook* could play 31-27 leading to a draw, or play 19-23 with a small advantage and still some play left in the position. Again, *Chinook* assumes the opponent knows as much as it does. Marion, of course, had considered this line and double checked that the resulting endgame is a draw. For practical purposes, 31-27 offered more chances for the opponent to go wrong and should have been played. **19-23 12-16 06-09 14-10 21-17 10-07 23-26 31-22 17-26 07-03 09-14 16-19 13-17 28-24 17-22 19-15 14-17 03-07 17-21 07-10 21-25 15-19 25-30 24-20 30-25 20-16 Drawn**

Tinsley - Chinook
Game 27

09-14 23-19 14-18 22-15 11-18 26-22 07-11 22-15 11-18 31-26 08-11 19-15 10-19 24-08 04-11 28-24 11-15 21-17 03-07 17-14 06-10 25-21 10-17 21-14 01-06 26-23 12-16 29-25 *Chinook*'s small advantage has dissipated and it is now a draw. **06-09 30-26 07-10 14-07 02-11 23-14 09-18 26-23 18-22 25-18 15-22 24-19 16-20 23-18 Drawn**

Chinook - Tinsley
Game 28

09-14 23-19 14-18 22-15 11-18 26-22 07-11 22-15 11-18 21-17 03-07 25-21 07-11 30-26 11-16 19-15 10-19 24-15 05-09 17-13 16-19 21-17 12-16 This position has some similarities with my humorous position from game 8. But here the differences are significant, since *Chinook* now sees the game as drawn. **17-14 08-12** At the time, this game caused quite a stir. Most members of the audience thought *Chinook* was lost. Of course, I was unaware of all this pessimism, since *Chinook* was quite happy with the draw that it saw, but the audience didn't. As it happens, this sacrifice is published play. **14-05 18-23 27-18 19-24 28-19 16-30 15-11 12-16 18-15 16-20 32-27 06-09 13-06 01-19 05-01 19-24 01-05 24-28 05-09 28-32 31-26 30-23 27-18 32-27 Drawn** The audience gave us a long round of appreciative applause for this game.

That evening, Norm, Paul, Rob and I discussed our strategy for the remaining 12 games. We were down one game, and had to do something to increase our chances of tieing the match. Before coming to London, we had considered this problem, but decide we didn't have time then to address it. Now we were faced with a dilemma. We could do nothing and hope for the best. Or alternatively, we could make some changes to the

program (such as making it more aggressive), but this could easily backfire.

SCORE: Tinsley 14.5 : 13.5 Chinook

Wednesday, August 26

Chinook - Tinsley
Game 29

Before the game, I made two changes to the program. First, some small modifications were made to the search parameters, which might change the style of play of the program slightly. Second, I put a bias in the program to shy away from published play (or at least the small amount of published play that *Chinook* knew about). How these changes influenced the program is difficult to say. However, these (and subsequent) changes did not save the match. The *Chinook* of the last 12 games is a different program, for better or worse, then the *Chinook* of the first 28.

11-16 21-17 09-14 25-21 16-19 24-15 10-19 17-10 06-15 23-16 12-19 21-17 02-06 29-25 05-09 25-21 08-12 27-23 04-08 23-16 12-19 32-27 06-10 17-13 01-06 Announcing a draw. Another quiet game. **26-23 19-26 30-23 09-14 22-17 07-11 27-24 08-12 24-19 15-24 28-19 11-15 31-26 15-24 26-22 24-28 Drawn**

Tinsley - Chinook
Game 30

11-16 21-17 09-14 25-21 08-11 17-13 11-15 24-19 15-24 28-19 04-08 22-18 08-11 18-09 05-14 29-25 11-15 25-22 15-24 27-11 Another quick draw. **07-16 22-18 01-05 18-09 05-14 26-22 16-19 23-16 12-19 22-17 Drawn** Inadvertently, the game had transposed into game 6, even though the games started with a different balloted opening.

Tinsley - Chinook
Game 31

An hour before the game, my wife Stephanie and daughter Rebecca arrived at the hotel, tired from an over-night flight from Canada. They provided a welcome respite from the tension at the checker board.

09-13 22-18 10-15 25-22 06-10 23-19 11-16 18-11 16-23 27-18 08-15 18-11 07-16 24-20 A prepared cook that, unfortunately, does not lead to much. **16-19 22-18 04-08** Marion said he could see his draw now. **32-27 03-07 18-14 10-17 21-14 08-11 27-23 11-15 23-16 12-19 31-27 15-18 29-25 01-06 27-24** The game has been even so far. Marion has added a little excitement to the game for the audience by temporarily going down a man.

19-23 26-19 18-23 25-22 06-10 14-09 05-14 22-18 14-17 19-16 07-11 16-07 02-11 18-14 10-15 14-10 23-27 10-07 27-31 07-02 31-27 02-07 11-16 20-11 Drawn We will retire this cook from our arsenal.

Chinook - Tinsley
Game 32

09-13 22-18 10-15 25-22 06-10 23-19 11-16 18-11 16-23 27-18 08-15 18-11 07-16 22-18 04-08 29-25 08-11 18-14 10-17 21-14 03-07 32-27 01-06 *Chinook* is on its own now and discovers it is down 31 points. **27-23 13-17** Originally, *Chinook* intended to play 16-20 but the score kept dropping. At depth 19, 13-17 emerged, down 23 points. This move has been called "staggeringly ugly" which I think is unfair. The entire line of play seems to be critical for black, so maybe the fault lies in an earlier move selection. After 13-17, Marion said he expected to win. **24-19 06-10** Panic! *Chinook* suddenly discovered losses everywhere. Its first choice of 06-10 it felt was losing, so it switched to 17-21. 17-21 seemed to be losing, so it found temporary relief in 16-20. This optimism was short-lived, because a deeper search revealed trouble. 17-21 re-emerged as best, only to be replaced by 06-09 and finally, at depth 21, with 06-10. *Chinook* was down 54 points and I was sure we were lost. This may have been the critical position. Black's position hangs by a thread and it appears that everything else loses. Perhaps we were lucky that we found the right move at the last minute. I could not bear to watch the denouement. I let Norm finish the game, while I sought solace with my wife and daughter. **25-21 02-06 23-18 16-23 26-19 11-16 31-26 16-23 26-19 17-22 21-17 06-09 17-13 10-17 13-06 07-11** After a while, I figured if *Chinook* was going to lose, I should at least be on stage to congratulate Marion. On entering the room, I glanced at the board and confirmed my worst fears - we were obviously in deep trouble. Upon resuming my place in front of the computer terminal beside Norman, I was surprised to see that *Chinook* said it was only down 32 points but, more importantly, the score had not changed in several moves. As in game 1, *Chinook* knew that Tinsley had a big advantage but could find no way for him to make any progress. **06-02 11-16 19-15 16-19** Too much knowledge is a dangerous thing. In analyzing past losses, we had concluded before the match that *Chinook* did not properly understand the long-term consequences of moves like 17-21. In this game, if we ever played it, black would be lost. The question was, when Marion brought his king to 14, attacking the checker on 17, would we run to 21 or 22? 21 we knew would be a sure loss; 22 might be a draw. **02-07 19-23 07-10 22-26 10-14 17-22** Whew! *Chinook*'s assessment had improved to only a 17 point deficit. **15-10 26-31 10-07 31-27 07-02 22-26 02-07 26-31 07-10 31-26** Finally, seeing the draw. **14-17 05-09 17-13 27-24 28-19 26-22 13-06 22-24 Drawn** I guess I have to learn to have more faith in *Chinook*.

Several computer chess programmers have suggested that competitive games were too strenuous for the authors of the program to watch. They suggest that the programmers be required to spend the duration of the game in a restaurant or lounge, while letting someone else operate the program. When the game is over, the programmers would be invited back in to the playing hall and told the game result. There is a lot to be said about this proposal.

SCORE: Tinsley 16.5 : 15.5 Chinook

Thursday, August 27

Chinook - Tinsley
Game 33

11-16 21-17 08-11 17-14 10-17 22-13 04-08 23-18 16-19 A new defense, or so I am told. Although this is supposed to be one of the more lop-sided openings, a depth 19 search says the position is even. **24-15 09-14 18-09 11-18 25-21 05-14 28-24 07-11 29-25 11-15 26-23 03-07 30-26 07-10** Depth 19 reveals the game is drawn. When you consider that there are 18 men on the board, it is amazing that the program can already announce the result of the game, assuming Dr. Tinsley does not make a mistake. Maybe this opening is not as difficult as its reputation would have it. **23-19 08-11 26-23 02-07 32-28 01-05 21-17 14-30 23-14 10-17 19-03 11-16 24-20 16-19 03-07 30-25 07-11 17-22 27-24 19-23 20-16 12-19 24-15 22-26 31-22 25-18 Drawn** Another quiet game from our point of view, but of tremendous interest to the spectators and the opening theorists.

Tinsley - Chinook
Game 34

11-16 21-17 08-11 17-14 10-17 22-13 04-08 23-18 16-19 Should we be flattered that Marion repeats our novelty of the previous game? **24-15 09-14 18-09 11-18 28-24** Varying from game 33, without any real advantage. **05-14 26-23 07-11 25-21 11-15 29-25 08-11 30-26 03-07 26-22** And now a draw is found. *Chinook*'s new defense looks quite good. **11-16 22-17 06-10 25-22 18-25 23-19 16-23 27-09 25-29 09-06 02-09 13-06 15-19 24-15 10-19 06-02 07-11 17-14 19-23 14-10 29-25 10-07 11-15 07-03 15-18 03-08 Drawn**

Tinsley - Chinook
Game 35

09-13 23-18 06-09 26-23 01-06 30-26 11-15 18-11 08-15 22-17 13-22 25-11 07-16 24-20 03-08 20-11 08-15 29-25 04-08 25-22 A 29 point advantage for *Chinook*, but once again it leads nowhere against the precise play of the World Champion. **08-11 28-24 09-14 24-20** Suddenly, the advantage jumps to 60 points. We were seasoned veterans of score fluctuations now and did not get our hopes up too high yet. **06-09 22-17 15-18 17-13** And now sanity prevails, the score is down to 12. **10-15 13-06 02-09 23-19 15-24 32-28 18-23 26-19** An artistic position! **09-13 20-16 11-20 19-15 13-17 28-19 17-22 15-10 22-25 10-06 25-30 06-02 30-25 02-06 14-18 19-16 Drawn** We were running out of opportunities on the strong side.

Chinook - Tinsley
Game 36

09-13 23-18 06-09 26-23 01-06 30-26 11-15 18-11 08-15 22-17 13-22 25-11 07-16 29-25 04-08 24-20 08-11 25-22 10-14 What is going on here? We are supposed to be on the weak side, but *Chinook* assesses the position as being up 10 points. **22-17 14-18 23-14 09-18 27-23 18-27 32-23 03-07** The advantage dissipates and a draw is announced. **28-24 11-15 20-11 07-16 24-20 16-19 23-16 12-19 26-23 19-26 31-22 15-19 Drawn**

Some commentators say we defended accurately in this game. According to *Chinook,* it was Tinsley that did the accurate defending!

SCORE: Tinsley 18.5 : 17.5 Chinook

Saturday, August 29

There were only 4 games left, 2 with the strong side, so drastic measures were required. This morning, we modified the program to discourage exchanges of pieces. We wanted the program to try and keep as many men on the board as possible, hoping thereby to create more complications.

Chinook - Tinsley
Game 37

09-13 24-20 10-15 28-24 05-09 23-18 01-05 27-23 06-10 23-19 11-16 20-11 07-23 18-11 08-15 26-19 03-07 30-26 07-11 26-23 09-14 22-18 15-22 25-09 05-14 29-25 11-15 Announcing a draw, exactly what we did not want to see. **25-22 02-07 24-20 15-24 22-18 14-17 21-14 10-17 32-28 24-27 31-24 17-22 Drawn** Although this was published play throughout, *Chinook* discovered most of the moves on its own. It played the best moves, which also happened to be well-known to Marion.

After this game, the organizers brought out the trophies for the winner and "runner-up" in the match. For some prophetic reason, they put the large winner's trophy on Marion's side of the table, and the smaller consolation trophy on ours. I made sure they were switched later on!

Tinsley - Chinook
Game 38

09-13 24-20 10-15 28-24 05-09 23-19 Our only hope. This innovation proves not to be as strong as the usual line, but at least it forces Marion to be careful. **06-10 26-23 01-05 30-26** Imagine my disbelief when *Chinook* announced a draw with all 24 men on the board. It changes its mind next move to -5, but obviously the program is close to demonstrating the game is over. **09-14 22-17 13-22 25-09 05-14 26-22 14-18 23-14** Now we find the draw with certainty. Normally, it would not matter that a game ends so soon, but being down 1 game, this was a big disappointment. Incidentally, these early draws show how powerful the endgame databases are. Once we complete all the 8-piece endgames, we will be able to announce draws even earlier than this. One day we may even be able to announce a draw as early as the first move of the game! **10-26 19-10 07-14 31-22**

14-18 22-15 11-18 27-23 18-27 32-23 03-07 21-17 08-11 23-18 11-16 20-11 07-16 17-13 Drawn

Tinsley - Chinook
Game 39

The tournament hall was overflowing with spectators. The balloted opening, the White Doctor, could not have provided a more fitting conclusion. Before the game, we yet again modified the program's parameters, hoping for a miracle.

10-14 22-18 12-16 24-20 16-19 23-16 The program has no opening knowledge of how to play the strong side of the White Doctor. *Chinook* discovers all its moves on its own. Tinsley must give up the checker, giving *Chinook* an 87 point advantage. We had no illusions about the score. **14-23 26-19 08-12 25-22 06-10 29-25** Depth 19 drops the score to 62. **11-15 30-26** And now it drops to 25. *Chinook* can see that it must return the checker, but thinks it can retain a small advantage. **15-24 28-19 04-08 22-18 08-11 18-15** The White Doctor is a feared opening. But in this complicated position, only 10 moves into the game, *Chinook* sees that its intended 26-22 leads to a draw. So far, *Chinook* has discovered one of the standard attacks and Dr. Tinsley, who practically wrote the book on defending the White Doctor, has made all the right moves. In this game, a draw is not enough, since we would have no chances of defeating Marion on the weak side of this opening. By 1/100th of a checker, *Chinook* innovated and came up with 18-15. Although someday someone might show this to be a poor move, objectively speaking it is the best chance given the match circumstances. Dare we attribute some human characteristics to *Chinook*? **11-18 26-22 10-15 19-10 12-19 22-15 07-14 27-23 19-26 31-22 09-13 20-16** The first inkling of trouble. An even game is suddenly an 18 point disadvantage. **02-06 15-11 06-10 32-27 10-15 27-24 14-18 16-12** Now, *Chinook* realizes it is lost. The World Champion displays his finest endgame technique. **18-23 11-08 23-27 08-04 27-32 04-08 01-06 08-11 06-10 11-18 10-14 18-09 05-14 22-18** I was playing on out of inertia. I did not want to resign and end this match. Couldn't we play a few more games? **14-23 25-22 23-26 24-20 32-27 22-18 27-23 18-14 23-18 14-09 26-31 09-05 31-27 05-01** At this point, Marion said something which brought me back to reality and I tendered *Chinook*'s resignation. **Tinsley Wins** Marion jumped to his feet and amid thunderous, appreciative applause raised his arms in triumph and exclaimed "Three cheers for human beings - and that includes Jonathan".

Epilog

In July, if someone had told me that *Chinook* would lose by only 2 points in the match, I would have been delighted. Then why was I so sad? *Chinook* had come unexpectedly close to dethroning Dr. Tinsley and I guess with success I started to raise my standards. Nevertheless, I am delighted with the result, both for Marion and ourselves. The only blemish is the infamous game 18. I will wonder for a long time what course the match would have taken had we not forfeited.

Within 16 hours of the match ending, Marion was on his way back to Talahassee, Paul Lu was heading back to Edmonton, Rob Lake was traveling on to Turkey and Norman Treloar spent a few more days in London. My wife, daughter and I spent a week traveling around southern England before going back home to Edmonton.

A week later, while walking the streets in Cambridge, England, a man approached me, wanting to know if I was the author of *Chinook*! Andy Warhol once said that everyone was famous for 15 minutes in their life. In my case, it was for 2 weeks.

In conclusion, many people have to be acknowledged: Silicon Graphics, the sponsor (Bob Bishop who made this all possible, Howard Rippener of SGI Reading who put the show together, Ayad Jassim of SGI Reading for his technical help, Connie Griffith of SGI Canada for prematch preparations); David Levy, Raymond Keene and Tony Buzan, were the organizers; Con McCarrick was the match arbiter; and Tom Landry produced the daily bulletins. Everything was done to ensure a successful event. It was a privilege to be part of it.

My sincerest thanks go to Marion Tinsley. It would have been easy for him to say "No!" and not play the computer. Instead, he put his reputation on the line and proved himself to be the great champion that he is. There is no doubt that the better player won.