

Peeking into the Future Nothing Like the Real Thing



The Silicon War by Chuck Bower Which is Best: Expect BG, JellyFish or TD-Gammon?

I have seen a fair amount of discussion in print about the relative abilities of the three best known silicon backgammon programs:

- 1) **Expert Backgammon 2.1** for the PC^(NOTE1),
- 2) **JellyFish Analyzer 1.0**^(NOTE2), and
- 3) **TD-Gammon**^(NOTE3) (current version 2.1?).

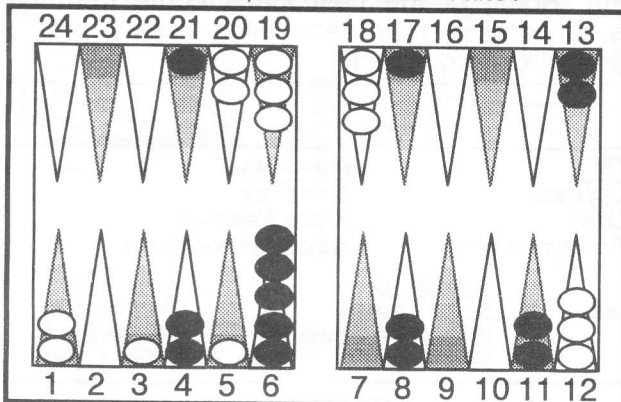
Unfortunately most of what has been written is qualitative, not quantitative. This article is an attempt to *toss into the ring* some concrete (hopefully objective) evidence.

The May-June 1994 issue of **Inside Backgammon**^(NOTE4) contained an article by *Gerry Tesauro* (creator of TD-Gammon) annotating a **FIBS** match between *Kit Woolsey* and **TD-Gammon**.

Comments were provided by both Tesauro and Woolsey discussing several plays made during the game (by both sides). In particular, 10 positions (reproduced here as a *quiz*) were analyzed in depth using the results of TD-Gammon rollouts. In addition, TD-Gammon's 2-ply^(NOTE5) evaluation was used as a second tool. These ten positions led to a total of 20 resulting propositions through the possible moves. In all positions, the score is 6-6 in a 9-point match.

The Silicon War Quiz

Position 1
Black on Roll, Should Black Double?
If Black Doubles, Should White Take?



1

...continues page 3...

I'd like to comment on the article **Peeking into the Future of Backgammon Tournaments** (HBC Newsletter May-June 1995). The article is correct in pointing out that many of the *administrative* aspects of backgammon tournaments may be well served by the inclusion of computers. Actual play of a tourney where a computer/server arrangement is used to replace a **real** board is fraught with peril and will most likely never be seen for cash payoff tournaments. While the plusses of *backgammon-by-wire* seem obvious, I'd like to go through some of the negatives which provide seemingly insurmountable obstacles for having a cash tournament where the actual play is done on computers.

The first problem is cheating. It's quite obvious that **FIBS** lends itself to many forms of cheating. If players will cheat for mere rating points, imagine the lengths players will go to when a large prize pool is involved **shudder**. It is therefore impossible to have a cash tournament where the actual players are scattered around the world and maintain any form of integrity.

Let's look at a more traditional extension of this idea where players still have to be in the same room to play but instead of *bring your own board* its *bring your own laptop*. In this scenario the player's costs have risen due to the outlay for a laptop and necessary hardware/software to connect to the tournament supplied server (also raising tourney costs). The problem here is **JELLYFISH**. Unfortunately this great learning/teaching aid (along with every other analysis program out there) can be used to cheat. It's a rather trivial programming exercise to have the moves *piped* into an analysis program and have it flash a small window with the optimal move/cube action and then withdraw into the background. Is there a solution for this abuse?

Well, the tournament could supply laptops/dumb terminals to all players (watching the percent return dwindle as tourney costs rise). The tourney officials could also inspect each players laptops or insist they be wiped prior to each session (impractical, hard to enforce, tourney time rising due to the tedious process of inspecting everyones computers). It's easy to see how computers introduce new worries into a situation where paranoia is already high.

Players barely trust dice. Large dice/small dice/double precision dice/flat dots/indented dots....the worries and debates are endless. Now remove the dice and introduce a *random number generator*. Computers aren't really very good at generating random numbers and there are literally hundreds of algorithms out there and all seem to produce some form of suspicion in players no matter how much data ...continues page 3...

1995 HOOSIER BACKGAMMON CLUB Gammon Point Standings.

HBC **Player of the Month** for **May** was **Woody Woodworth** with 204 gammon points.

HBC **Player of the Month** for **June** was **Woody Woodworth** with 234 gammon points.

1)	Butch Meese.....	816	Neil Ezell.....	260	Bill Hodes.....	40
2)	Woody Woodworth.....	812	Chuck Bower.....	248	Reggie Porter.....	32
3)	Don Woods.....	742	Kevin McLeaster.....	150	Dave Cardwell.....	30
4)	Ellis Bray.....	732	Rick Reahard.....	110	Bob Cassell.....	20
5)	Chuck Stimming.....	670	J.A. Miller.....	80	David Smith.....	20
6)	Larry Strommen.....	578	Brian Nelson.....	78	Peter Kalba.....	20
7)	Gabe Stiasny.....	534	Bill Gheen.....	70	Richard Heinz.....	16
8)	Dave Groner.....	508	Steve Perlman.....	64	Lance Jenkins.....	16
9)	Jan Gurvitz.....	358	Wendy Kaplan.....	60	Elijah Miller.....	16
T10)	Sean Garber.....	290	Scott Richardson.....	48	Dave Fey.....	10
T10)	Mary Ann Meese.....	290	Philip Degen.....	48	Paul Ruterman.....	10
	Mick Dobratz.....	260	Stan Gurvitz.....	46	Tom Helt.....	10

From the Mailbox:

I liked Chuck Bower's article on the 4-3 opening. Chess has so many giant books on the opening - why can't BG have just one? Maybe you will write it.

For Table 1A, you show only one 5-2 response, 13/8, 24/22. I prefer 13/8, 6/4 because of the duplication of 3's and because I really hate the 24/22 split generally. Could you run that by EXBG?

Thanks,
Mary Hickey, Kirkersville, OH

Reply from Chuck Bower:

Mary, thanks for the kudos. At your request I have run the two 52 replies to the 43 (24/20, 13/10) opening through both **Expert Backgammon 2.1** and **JellyFish Analyzer 1.0**. Both programs give similar answers. Using the format of my HBC Mar-Apr 1995 article:

Opening Play of 24-20, 13-10 for roll 4-3.

reply roll	candidate play	cubeless equity	relative merit
52 (EXBG)	13/8, 24/22	-0.140	(best)
52 (EXBG)	13/8, 6/4	-0.209	0%
52 (Jellyfish)	13/8, 24/22	-0.132	(best)
52 (Jellyfish)	13/8, 6/4	-0.191	0%

Your preferred *slot-duplication* play does not meet with the approval of the current, commercially available software. This is consistent with their general dislike of slotting on either the opening or the response.

Although the duplication appears attractive, the slot just doesn't seem to be worth the risk of losing 21 pips and tempo.

As to the merits of 24/22, it is typically my least favorite split, also. (Joe Sylvester points out one downside to this split: some of the numbers which subsequently build--for example 31 and 42--are duplicates of good numbers on your side of the board.) However, EXBG and JellyFish rollouts find it the most constructive (least destructive?) 2 in this position. Recently, slotting the five point has regained favor among some experts (for example, Bill Robertie). Actually, it never fell from grace with some. I expect the split versus slot debate to continue, so if you feel more comfortable with your play, I encourage you to use it. It may prove to be the correct option in the long run!

Important Issue: Slow Play

From time to time important issues come to the forefront that demand our attention. In the past, one was the **Holland Rule** and today it is **Slow Play**. There has been discussion and suggestions on the Internet (rec.games.backgammon). It was the main topic of discussion at dinner after the Michigan Summer Championships. So far alot of talk but no solution. Some of the best ideas come from the players, so send us your ideas, either regular mail or email: hbc@ix.netcom.com.

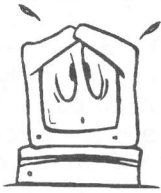
	<u>May 4th</u>	<u>May 11th</u>	<u>May 18th</u>	<u>May 25th</u>	
1st	Bill Gheen	Woody Woodworth	Mick Dobratz	Ellis Bray	
2nd	Butch Meese	Butch Meese	Neil Ezell	Steve Perlman	
2nd	...	Larry Strommen	Woody Woodworth	Woody Woodworth	
	<u>June 1st</u>	<u>June 8th</u>	<u>June 15th</u>	<u>June 22nd</u>	<u>June 29th</u>
1st	Larry Strommen	Butch Meese	Woody Woodworth	Butch Meese	Don Woods
2nd	Woody Woodworth	Woody Woodworth	Butch Meese	Woody Woodworth	Ellis Bray
2nd	Don Woods	Phil Degen	...

Backgammon Tournament Schedule

Aug 16-20.....	Las Vegas Open, Riviera Hotel & Casino, Las Vegas, NV.....	(702) 893-6025
Sep 01-04.....	43rd INDIANA OPEN , Ramada Inn East, Indianapolis.....	(317) 845-8435
Oct 06-08.....	Nation's Capital Fall Championships, Promenade, Bethesda, MD.....	(301) 530-0604
Oct 11-15.....	5th Illinois Championships & American Cup, Sheraton, Northbrook, IL.....	(708) 945-7801
Oct 27-29.....	Autumn Gran Prix, Embassy Suite Hotel, La Jolla, CA.....	(619) 294-2007

Thursdays..... 7:00 PM at **SPATS** (842-3465) Castleton Square (between J.C.Penney's & L.S.Ayres). 845-8435

Peeking into the Future Nothing Like the Real Thing



...continues from page 1...

is produced showing how good a certain scheme is. Look for major headaches for the director.

Computers are machines...they break. Imagine in the middle of a 31-point match and the server crashes (for whatever reason...and there are many)....boom....everything wiped out. Ah, you say, *What about automatic saves? That'd fix things!* Well...sort of. A save after every move creates alot of *wire traffic* and CPU cycles and disk accesses. All of a sudden the *tourney slows to a dead crawl* because there's just too much going on for the server to handle speedily. The computer that was supposed to speed things up is slowing things down instead. Look for Valium for the director.

An unscupulous player *hacks* the server at night. A power surge zaps a few machines or the server. A player's laptop runs out of juice. A drive crashes and there are no spare machines. The random number generator just gave a player double sixes 8 times in a row. There was a small bug in the *legal move* code that allowed players to commit game winning illegal moves. Look for a hospital for the director.

Considering all this...the rattle of dice cups, the click of checkers on a good *old fashioned* real board, the nervous tension so thick it can be cut with a knife just before the opening roll and the sighs/moans/wails of the players as the odds catch up with the losers and make heroes out of the winners...are perhaps the sweetest things in the world and perhaps make the final reason why *bg-by-wire* will never rival the **real thing**.

Thanks, Jeff Seidel

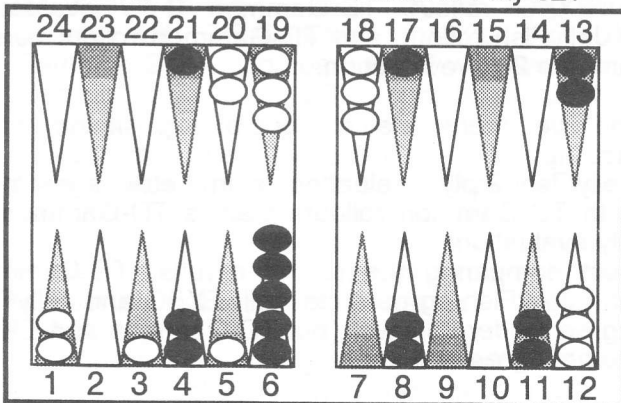
E-Mail: jeffs@shadow.net

FIBS: (Stopped playing on FIBS, may return but not overly enthused about it)

The Silicon War Quiz

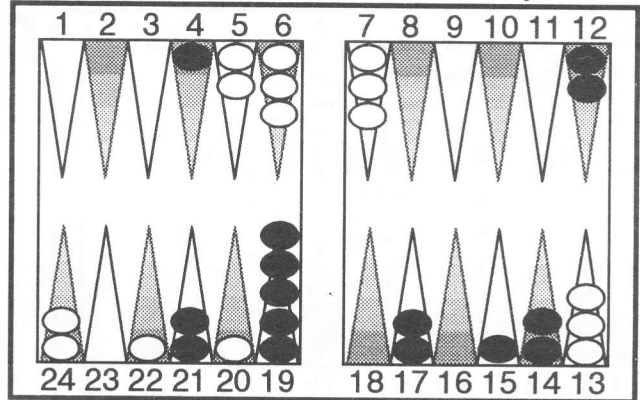
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Position 2 Black to Play 52?



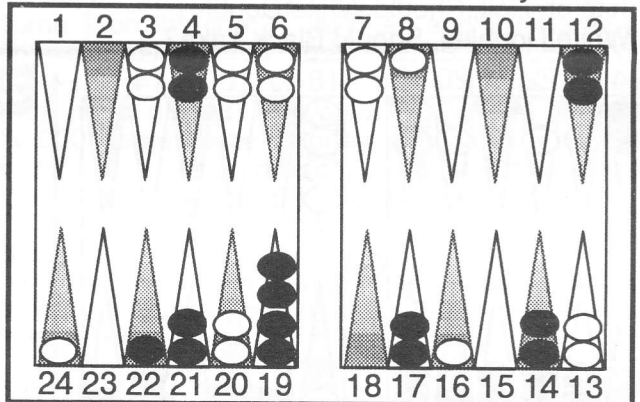
2

Position 3 White to Play 31?



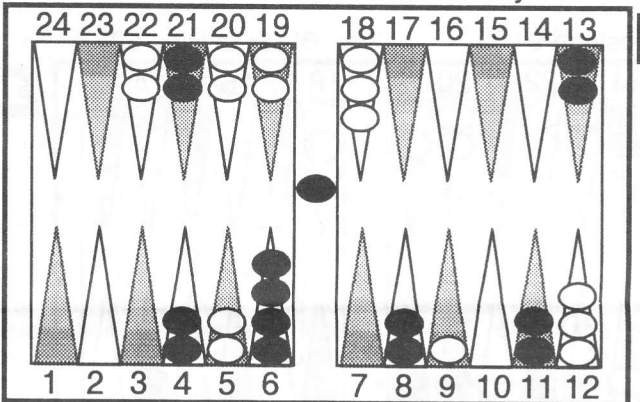
2

Position 4 White to Play 22?



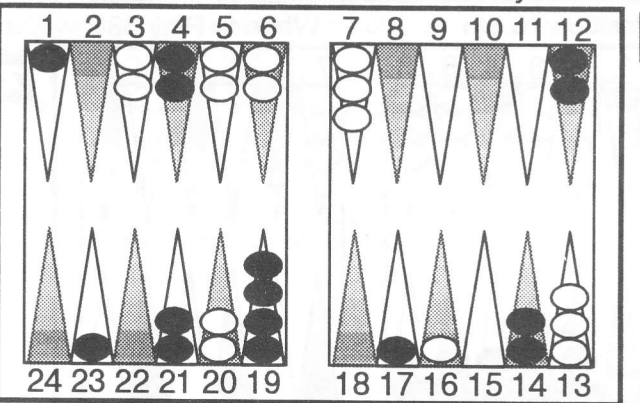
2

Position 5 Black to Play 61?



2

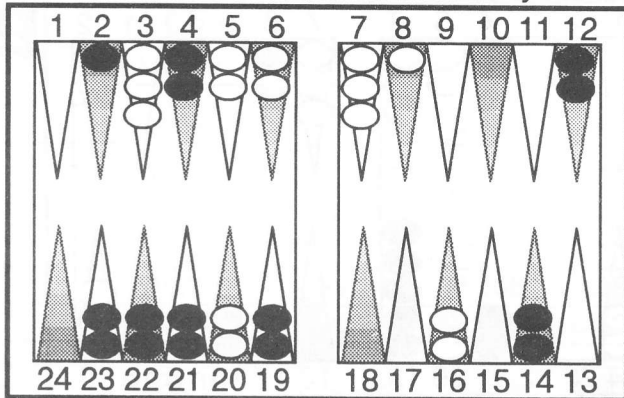
Position 6 White to Play 42?



2

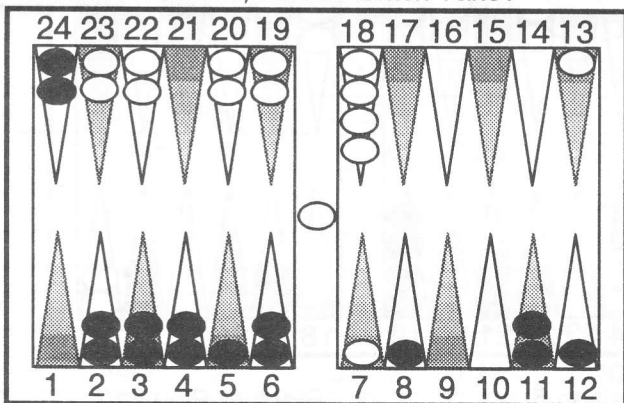
Position 7

White to Play 43?



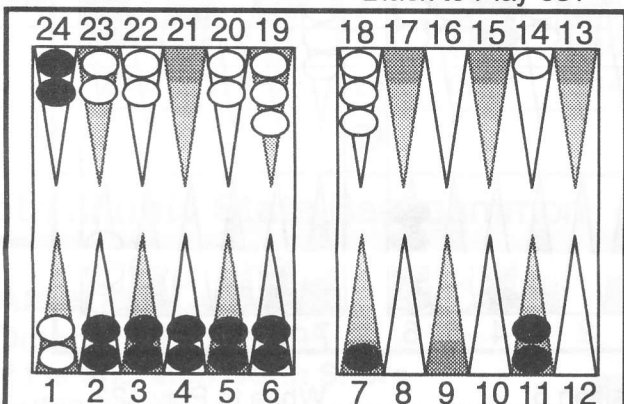
Position 8

White on Roll, Should White Double?
If White Doubles, Should Black Take?



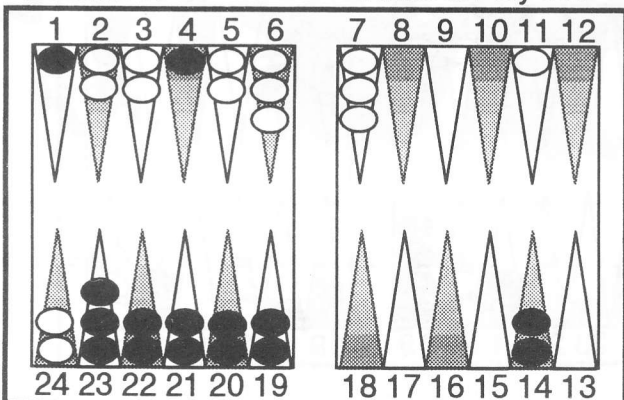
Position 9

Black to Play 53?



Position 10

White to Play 33?



I fed the 20 propositions into both JellyFish and EXBG. I asked JellyFish to analyze the propositions using its 2-ply neural net (also referred to as *Level 6* and *Lookahead* mode). This is the highest level of evaluation that the current JellyFish version provides. I then had JellyFish perform cubeless rollouts^(NOTE6) of each of the 20 propositions. Each proposition was played to completion 7776 times by JellyFish.

Likewise I had EXBG roll out each proposition a minimum of 3888 times (some were rolled out over 20,000 times). By comparison, the TD-Gammon rollout results provided in the above mentioned **Inside Backgammon** article were performed 3000 times for each of the 20 propositions.

Table 1 is a compilation of the results of all rollouts in units of cubeless equity. The *correct* answers (as seen by each computer analyst) are highlighted in each column so that you can compare your answers to the silicon experts.

For the statistically inclined, also included are the standard deviations of the JellyFish rollout results and EXBG rollouts (in the last two columns). The TD-Gammon rollout standard deviations were not given in Tesaro's article, but can be estimated as approximately 1.6 times the JellyFish standard deviations, or about 0.025 for each of the 20 propositions.

Figure 1 is a summary of how the different software compared with each other^(NOTE7). In this bar chart, a shorter bar indicates better agreement than a taller bar. Since rollouts have statistical uncertainties (resulting from fickle dice—a concept well understood by backgammon players!). More rollouts may lead to somewhat different results. (This is discussed more technically in a later paragraph.)

Ignoring the last bar for the moment, the graph seems to be broken into three groupings. The first three bars are roughly equal; then there is a second grouping of three, and finally a lone tall bar. The first bar (marked JFr-JF2) shows that the best agreement is between JellyFish rollouts and JellyFish 2-ply evaluation. The second bar (comparison between TD-Gammon rollouts and JellyFish 2-ply evaluation) and third bar (TD-Gammon rollouts versus JellyFish rollouts) are show less agreement, and based on statistics are virtually equivalent to the first comparison (JFr-JF2). The worst agreement is between EXBG rollouts and TD-Gammon rollouts (the tall seventh bar of the chart). There are three comparisons which are intermediate: JF-rollout versus EXBG rollout, TD-Gammon 2-ply evaluation versus JellyFish rollout, and TD-Gammon rollout versus TD-Gammon 2-ply evaluation.

I believe there are a couple expositions worth emphasizing:

- 1) JellyFish 2-ply evaluation is in better agreement with TD-Gammon rollouts than is TD-Gammon 2-ply evaluation!
- 2) Just comparing the rollout results, TD-Gammon and JellyFish agree quite well; EXBG and JellyFish agree moderately well, but TD-Gammon and EXBG do not agree well at all.

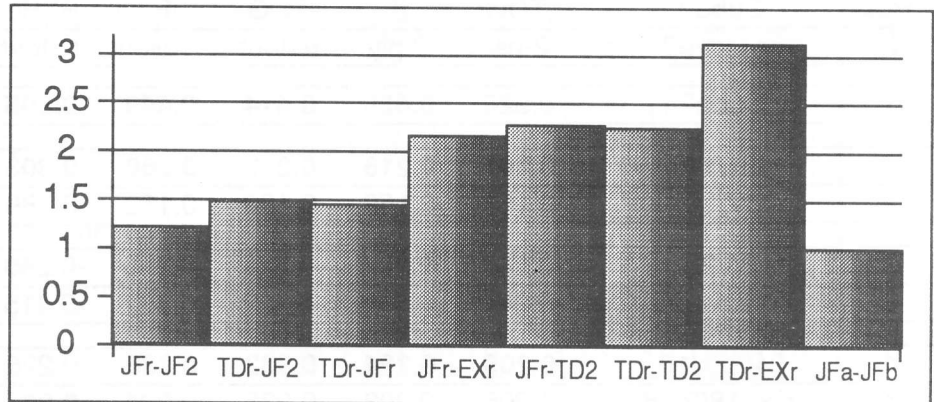
I will now attempt to explain the last bar of Figure 1 for those of you with a statistical interest. (Please refrain from substituting the word *sickness* for the word *interest*!) Those among you who are less mathematical (and thus more *intuitive*) will probably want to skip on to the next paragraph. The 7776 JellyFish rollouts for each of the 20 propositions were actually performed in two sets of 3888. These two sets (shown as columns 6 and 7 of Table 1) were statistically independent (that is, different seeds were used in the random number generator). I then compared these two sets of rollout results with each other in

the same way, for example, that I compared TD-Gammon rollouts with EXBG rollouts. If an infinite number of rollouts were performed for each position (instead of the 3888 as was actually done), then the height of the last column in figure 1 would have been zero. That is because the algorithms used in running the rollouts are identical. But since the dice aren't the same for a finite (in this case 3888) rollout, the same algorithm (that is, JellyFish's 1-ply neural net) gives different results. This indicates the *statistical error* when comparing two different rollout sequences: for example--column 7's comparison between TD-Gammon rollouts and EXBG rollouts. The height of the last bar is defined to be 1 and these are the units of the vertical axis in Figure 1. The RMS value of the comparison of these two JellyFish rollouts was 0.0352, which explains the normalization in Note 7.

So, what does all this mean, you say? Now you're trying to get me in trouble. What I have done is to make a comparison between the three software backgammon packages for 10 positions taken from A SINGLE BACKGAMMON GAME. Thus these positions are *interdependent*. Better would be 10 random positions from 10 different games. Even better would be thousands of independent positions, but even if I had the time to look at more positions, I unfortunately don't have access to TD-Gammon. In an article published in a computer journal^(NOTE8), Gerry Tesauro states ...a TD-Gammon rollout is now generally regarded as the most reliable method available for analyzing checker plays. If this is so, then Table 1 gives some evidence that JellyFish 2-ply is better than TD-Gammon 2-ply. (I say this based on the fact that JellyFish 2-ply agrees more closely with TD-Gammon rollouts than does TD-Gammon 2-ply. Compare bar 2 with bar 6 of Figure 1. Also, in 17 out of 20 propositions, JellyFish 2-ply evaluation got closer to TD-Gammon rollouts than did TD-Gammon 2-ply evaluations.) Likewise it looks like Expert Backgammon, for years the best commercially available BG software, has now fallen behind. Time for a new version? However, there are many more pieces of the puzzle. What about backgames? Races? Which is best at making cube decisions? Which is best in match play?

If there were an argument over which of two humans is a better backgammon player, the best way to settle it

Figure One



would be for them to play head-to-head (and to put some \$ on the line!). JellyFish and TD-Gammon have sparred against each other on FIBS, but I don't know the results, nor do I know how many games (or matches) they have played. I would like to see them have a 10,000 game battle (money play) and/or 1000 9-point matches. If set up properly, I doubt if it would take that long to play (few days?). Place your bets!

Notes

(1) Written by Tom Johnson and Tom Weaver. Available from Tom Weaver of Dallas at (214) 692-1234 or email: tomweave@netcom.com.

(2) Written by Frederick Dahl. Available from Larry Strommen of Indianapolis at (317) 545-0224 or email: diceman@indycom.com.

Both programs above are also available from Carol Joy Cole at (810) 232-9731 or email: carlcolr@umich.edu.

(3) Written by Gerald Tesauro of IBM Watson Research Center (Yorktown Heights, NY). The program is not commercial available. He may be reached by email: tesauro@watson.ibm.com.

(4) *Inside Backgammon* is a bi-monthly publication. Editors are Kent Goulding and Bill Robertie. US subscription rate is \$40/year. Address is P.O. Box 294, Arlington, MA 02174. Phone (617) 641-2091.

(5) *2-ply* refers to how deeply the computer program looks into the future. In *1-ply* evaluation, the computer just looks at the current position and calculates an equity. In *2-ply* evaluation, the computer looks at the 36 rolls of the next side to play, and then evaluates these resulting (21 or less) outcomes, weighting them by the roll's likelihood (for example, 52 is weighted twice as much as 22) to get an equity.

(6) According to Larry Strommen, JellyFish rollouts are performed with 1-ply evaluations after each roll of the dice. I believe that TD-Gammon rollouts are performed 2-ply, but I am not sure about this.

(7) The comparison is by *root mean square* (RMS) method. For each of the 20 propositions, the equity results of the two competitors were subtracted and this difference was then squared. These twenty squares were then added together and the square root was taken of this sum. Finally, this RMS was divided by 0.0352 for normalization.

(8) *Communications of the ACM*, vol. 38, #3 (March 1995) pp. 58-68.

Table One

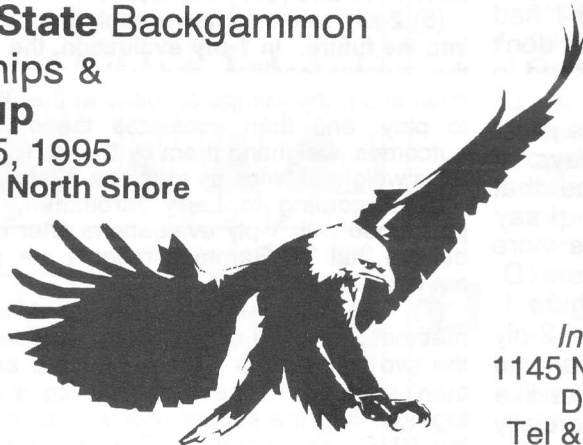
Pos	Cube?	TDG	JF	TDG	JF full	EXBG	JF-a	JF-b	JF full	EXBG
No.	or Move?	2-ply	2-ply	rollout	rollout	rollout	rollout	rollout	stddev.	stddev.
1	Cube?	0.326	0.428	0.414	0.449	0.505	0.463	0.436	0.016	0.012
2	21/14	0.191	0.216	0.220	0.260	0.303	0.259	0.260	0.013	0.022
2	17/10	0.151	0.159	0.169	0.162	0.189	0.178	0.145	0.016	0.022
3	24/20	-0.241	-0.266	-0.288	-0.245	-0.280	-0.218	-0.272	0.013	0.016
3	7/4x, 24/23	-0.247	-0.319	-0.322	-0.377	-0.415	-0.353	-0.402	0.015	0.023
4	24/22x/16	0.209	0.224	0.333	0.236	0.296	0.272	0.200	0.016	0.021
4	22x, 18(2), 6	0.206	0.203	0.235	0.224	0.297	0.230	0.218	0.016	0.017
5	B/24, 8/2	-0.468	-0.442	-0.422	-0.429	-0.493	-0.410	-0.448	0.016	0.011
5	B/24, 21/15	-0.443	-0.548	-0.441	-0.536	-0.555	-0.567	-0.504	0.018	0.011
6	13/7	0.342	0.272	0.246	0.295	0.411	0.301	0.289	0.016	0.012
6	20/16, 20/18	0.328	0.248	0.236	0.300	0.408	0.269	0.331	0.014	0.011
6	20/16, 7/5	0.310	0.243	0.211	0.263	0.359	0.275	0.251	0.015	0.011
7	20/16, 8/5	0.128	0.080	0.081	0.116	0.216	0.114	0.117	0.016	0.012
7	7/3, 8/5	0.112	0.156	0.067	0.130	0.163	0.134	0.126	0.016	0.009
8	Cube?	0.151	0.120	0.057	0.125	0.313	0.111	0.139	0.018	0.020
9	24/21, 7/2	0.112	0.165	0.205	0.245	0.287	0.232	0.257	0.016	0.012
9	24/16	0.105	0.141	0.158	0.214	0.198	0.226	0.202	0.016	0.012
10	7/4x(2), 7/1x	0.274	0.219	0.194	0.171	0.155	0.170	0.171	0.017	0.009
10	7/4x(2), 11, 5	0.251	0.217	0.109	0.123	0.068	0.128	0.117	0.016	0.009
10	7/4x/1x(2)	0.241	0.131	0.149	0.120	0.052	0.113	0.127	0.016	0.014

5th Illinois State Backgammon

Championships & America Cup

October 11-15, 1995
at the Sheraton North Shore
Northbrook, IL
(708) 498-6500

KG



Info: Yamin Yamin
1145 North Waukegan Road
Deerfield, IL 60015
Tel & Fax: (708) 945-7801

featuring...
\$2500 America Cup,
North America Club
Championships,
Masters, Doubles,
Championship,
Advanced, Limited
and a memorable
Columbus Path
plaque for
crossing
the ocean.

Hotel Alert: The Ramana Inn East is sold out except for rooms blocked for the 43rd Indiana Open. On August 1st, any rooms not booked will be released. Please reserve your room early and tell your friends. Even if you think there is small chance of attending, book a room and call us (317) 845-8435 if you need to cancel. And, of course, call us if you have any problems getting a room.

Annotated match
Kit Woolsey vs Jeremy Bagai
FIBS - 9 Point Match

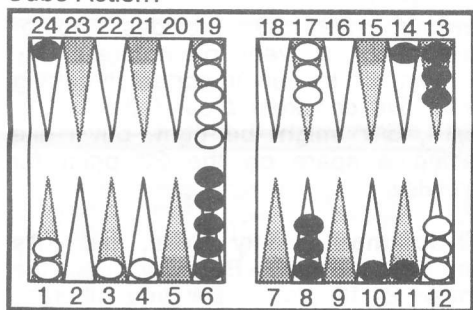
In February 1994, **Kit Woolsey** and **Jeremy Bagai** played a match and then annotated it for **FIBS** (First Internet Backgammon Server) players so they could see the thought process of the more experienced players. They played a fairly interesting match, logged it, and then annotated it independently. You will see reasons for their plays and cube decisions, as well as their second thoughts upon later analysis which often came to a different conclusion than their original choices.

Gerry Tesauro also volunteered **TD-Gammon's** valuable help. TD analyzed the whole match and listed its top 3 choices for each play along with its estimated equities. These equities are always assuming a 1-cube and they do not take into account cube ownership. Thus on a pass-take decision an equity of -0.50 would be a break-even decision (not taking cube ownership into account -- that would probably make it a little higher), since that would translate to an equity of -0.100 on a 2-cube. TD was also nice enough to comment on the game, giving its reasons behind its choices as well as getting in a few snide remarks about their mistakes. **Mark Damish** (MA), first formatted the commentary for the Internet.

Game 5 Continues...

White enters both checkers with 43.

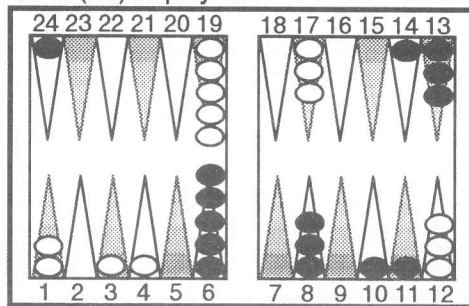
Cube Action?



Kit: If Jeremy had only gotten one checker in I would have had a sound double. As it is, it looks like his defense is too good. I still wait.

TD-Gammon: Equity is +0.342, and volatility still isn't all that huge. Again correct to wait.

Black (Kit) to play 52?



8/3* 6/4*

Kit: This is pretty wild; probably too much so. It will be great if it works, but if Jeremy hits back my position will be very strung out. I now prefer the safer and saner 14/9, 11/9, which at least insures that I will come of the fight with some point of value.

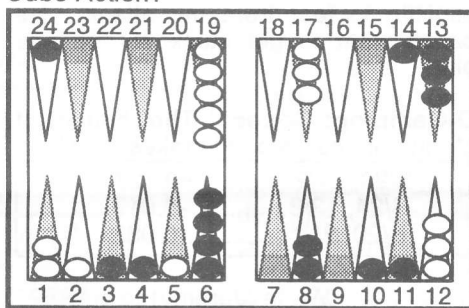
Jeremy: This looks better than making the nine piont which would give me my full roll to consolidate. But I'm not sure at all.

TD-Gammon: Kit is doing a lot better in the post-mortem this game than he did in the actual match. Making the nine piont is clearly superior, for the reasons that he gave.

14/9, 11/9.....	+0.246
8/3*, 6/4*.....	+0.207
14/9, 13/11.....	+0.150

White enters both checkers with 52.

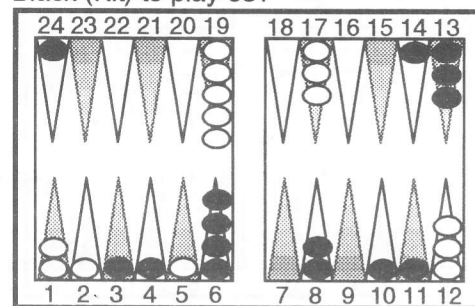
Cube Action?



Kit: Once again, not worth a cube turn. I just have too much cleaning up to do.

TD-Gammon: Equity has dropped to 0.283. Now a double is a long way away.

Black (Kit) to play 63?



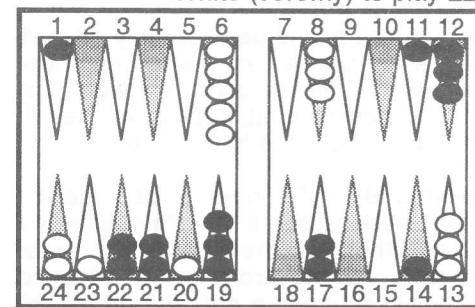
10/4 6/3

Kit: Looks best. Even though I fail to put Jeremy on the bar I grab two valuable inner board points and cut down on my blots. Now my earlier play when I left the checker on the 14 point may come back to haunt me.

TD-Gammon: It was best, although getting the outfield blots out of hock with 14/11, 10/4 wasn't far off.

10/4, 6/3.....	+0.355
14/11, 10/4.....	+0.335
11/8, 10/4.....	+0.255

White (Jeremy) to play 22?



13/11*9 6/4 6/4

Jeremy: The alternatives are 20/18, 13/11*, 6/4(2) and hitting twice with 20/14*, 13/11*. I like 11/9 better than 20/18 because I'd rather anchor on the 20 point than on the bar point, and I'll get more return shots if Kit hits loose there. On the other hand I'm giving him more fly shots in the outfield and when he does hit loose inside he is starting a more valuable point. Very close.

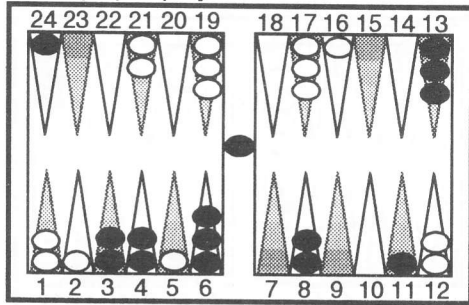
But the real question is should I hit twice. This gives me more time to do something with my back checkers (although it somewhat isolates them by removing the slot of the advanced anchor), but it doesn't make the four point which is very big.

I like my play, but either of the others could be correct.

TD-Gammon: Jeremy is 100% accurate in his fine analysis. His actual play is best, and the other two are close. I can hardly add to that.

13/11*9, 6/4(2).....	-0.273
20/18, 13/11, 6/4(2).....	-0.285
20/14*, 13/11*.....	-0.290

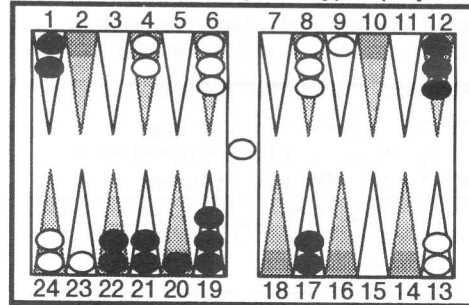
Black (Kit) to play 61?



B/24 11/5*

Jeremy: Clear.

White (Jeremy) to play 52?



B/20* 9/7

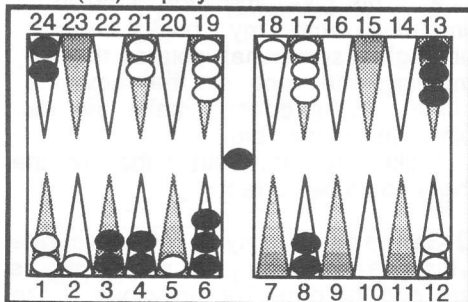
Kit: I guess this is best. Jeremy doesn't have an attractive two, so he brings the checker into the bar point. He won't like it if this checker is hit, but if it isn't he will have a good chance to improve.

Jeremy: B/20*/18 looks a bit better to me now because, if hit, I'd rather my return shots come from my rear checkers than from my stripped midpoint. Of course entering on the 23 point trying for a back game is hopeless.

TD-Gammon: Right you are in your analysis, Jeremy. Stepping into the way of fleeing enemy checkers is not the way to contain them. This is a common error made by a lot of humans.

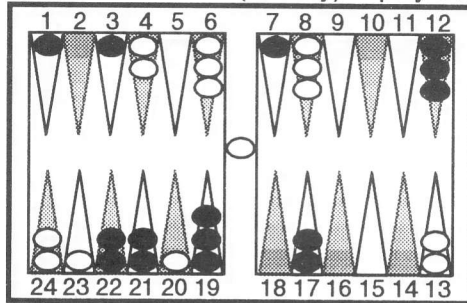
B/20*/18.....	-0.140
B/20*, 8/6.....	-0.192
B/20*, 6/4.....	-0.194
B/20*, 9/7.....	-0.206

Black (Kit) to play 63?



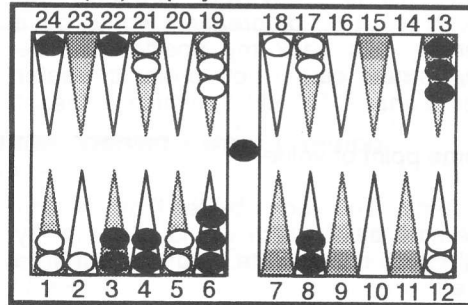
B/22 24/18*

White (Jeremy) to play 51?



B/20 8/7*

Black (Kit) to play 51?



B/20 24/23

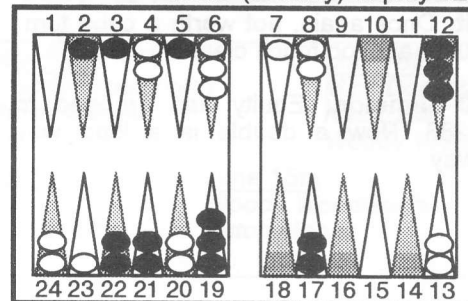
Kit: I refuse to be hemmed in. If I play B/24, 13/8 and Jeremy makes his bar point my checkers on the 24 point would be in trouble. I am exposing myself to an attack, but since Jeremy has few builders in position and my inner board is stronger than his the danger is not too great.

Jeremy: I think this is better than B/24, 13/8. I have five checkers back so Kit has little to fear from my attack. He doesn't want to get stuck on the ace point.

TD-Gammon: Correct. The thought of entering on the 24 point makes me ill.

B/20, 24/23.....	+0.127
B/24, 13/8.....	-0.017
B/20, 3/2*.....	-0.083

White (Jeremy) to play 52?



23/18 7/5*

Kit: Jeremy is unwilling to give up his eight point, so he plays somewhat cautiously. Reasonable, but now almost anything I roll hits something. I think he should have shot out 8/3*, 7/5*. This

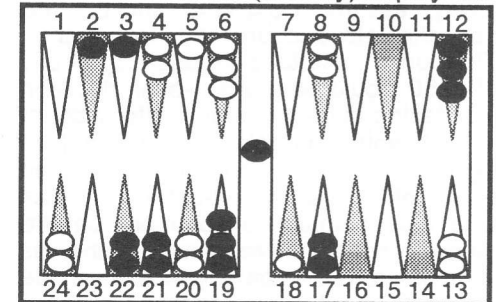
could work great if I miss, and if I hit one of the checkers he may have a chance to establish the third anchor in my board which will permit him to play very loosely in the future knowing that he will always have a solid back game in reserve.

TD-Gammon: Time for a sanity check, Kit. Take a look at who has the stronger inner board and ask where the builders would come from to continue your attack or how you would plan to get the eight point back. You have to learn to walk before you can run. Jeremy's play is clearly best.

23/18, 7/5*.....	-0.153
13/8, 7/5*.....	-0.223
8/3*, 7/5*.....	-0.230

Black (Kit) dances with 44.

White (Jeremy) to play 42?



24/20 5/3*

Kit: I prefer 18/14, 5/3*. This keeps the second anchor in case of disaster, and brings one checker closer to the battle area. Moving off the 24 point isn't too vital now, since he is in no danger of being primed.

Jeremy: 13/9, 5/3* provides another builder but is very premature. My midpoint will be very important in getting those five checkers around the board. 18/14, 5/3* might be right, but I like getting a spare on the 20 point for flexibility.

TD-Gammon: Pretty close, but Kit's play gets the nod. But how about the simple 24/18 play? Bet you hit-crazy humans never even thought of it. Yet it is certainly logical, locking up the second big advanced anchor and keeping open the possibility of making the five point. In fact, it is right up there in the rankings. Let's look at all the possibilities before jumping to conclusions.

18/14, 5/3*.....	-0.055
24/18.....	-0.056
24/20, 5/3*.....	-0.064

Game 5
...continues next issue...