NEWS, INFORMATION, TOURNAMENTS AND REPORTS

BOTVINNIK INTERVIEWED

by Raymond Keene, David Levy and Jaap van den Herik

Dr. Botvinnik, guest of honour at the first SWIFT-sponsored World Cup Chess Tournament, granted an interview to IGM Raymond Keene, ICCA President David Levy and the Editor-in-Chief. The parts relevant to computer chess are reproduced below. The interview took place in Brussels, Belgium on April 1, 1988.

LEVY: Dr. Botvinnik, I would first like to ask you for your comments on progress in computer chess in the last fifteen years. Mr. Keene and I interviewed you in Skopje in 1972. You were very optimistic and I was very pessimistic, and in the last fifteen or sixteen years the truth is somewhere between what you thought and what I thought. The programs are stronger than I thought they would be, and not so strong as you did. I would like to know what you think about this development, and what you think the future holds.

BOTVINNIK: Well, by now the position has become clear. The programs that are playing are roughly on the national master level, or that of a Soviet candidate master. At the moment I don't think they are getting further than that. This seems to be the limit as long as "brute force" is used. Increased speed - MIPS [Millions of Instructions per Second] - is not helping towards a solution. There is only one way the computers' play can be improved, and that is by equipping them with positional understanding. Our program, *Pioneer*, incorporates a two-part routine for evaluating positions. The first part relates to the placing of individual pieces on the board. The second part involves assessing pieces together, in configurations. This latter corresponds to a chessmaster's method of evaluation. The programs playing at present only have something like the first part. The hard nut to crack is to provide them with the second. Once this is done, computers will play more strongly than humans, since they are more efficient and have more resources.

I think Berliner has been improving his program's positional evaluation. I wouldn't know what the improvement consists in, but his program has been playing better. Richard Lang, the *Mephisto* programmer, also seems to have made this kind of improvement, and *Mephisto* has reached a high standard. But the second part of the evaluation procedure needs to be implemented in full.

LEVY: What do you think will happen in the future, in the next ten or twelve years? How much progress do you think will be made in computer chess?

BOTVINNIK: Our own program is completely ready on the conceptual level. However, the coding has been done by mathematicians who do not play chess. They've produced a very complex program, and there are lots of mistakes in it. It's about 60,000 lines of FORTRAN. And the computer is a weak one.

VAN DEN HERIK: What is it called?

BOTVINNIK: IBM three-seventy, one-forty-eight.

VAN DEN HERIK: You mean fifty-eight, I suppose ...?

BOTVINNIK: No, forty-eight! So right now there's nothing we can do. We're going to prepare a much simpler algorithm, and what we need is a good personal computer. I think we're going to get one sometime. Then one-and-a-half to two years will be enough to complete the work. I think this is now the only way forward in chess programming. If you just rely on what I called the first part of positional evaluation, and put your faith in MIPS, you will not make progress.

VAN DEN HERIK: Once you've implemented your ideas, in two years or so, how strong do you think your program will be?

BOTVINNIK: As strong as a master. In fact I would say that, except when bugs crop up, the program already performs like a master in the way it constructs a tree of variations.

VAN DEN HERIK: When you say "like a master", do you mean a player in the World Championship class?

BOTVINNIK: There are positions in which any master plays like the World Champion. And there are others in which he doesn't. When the number of moves in the program's tree of variations is small, just a few dozen - then all of them will be master moves. You know *Belle*, Ken Thompson's program? When *Belle* examines thirty million positions, *Pioneer* considers a million times fewer. It follows that nearly all moves considered by *Belle* are irrelevant, non-master moves.

VAN DEN HERIK: I've seen various games by *Belle*, but only individual positions played by *Pioneer*. Has *Pioneer* played any games?

BOTVINNIK: No. It's not in a position to, because it contains a lot of errors.

LEVY: Is it possible that *Pioneer* will be ready to play in time for the tournament next year in Edmonton?

BOTVINNIK: Well, is it possible that you will make me a present of a personal computer tomorrow?

LEVY: What kind do you need?

BOTVINNIK: One with a 32-bit processor ...

LEVY: Something like a MAC 2. We can get one, but the Americans have an embargo on certain technology going to the Soviet Union. So it's a question of how to solve this question of the embargo.

KEENE: Smuggle it.

BOTVINNIK: Siemens were willing to sell one, but I don't want to get it by illegal means.

LEVY: I understand. This is a problem.

BOTVINNIK: If the work is completed succesfully, we shall have to disclose what computer it was done on. Then it would come to light that the machine had been acquired illegally.

[REMARK: As noted by Misha Glenny (Warsaw) in New Scientist, April 28, 1988, p. 30, there seems to be no problem: anyone in the West may acquire a personal computer anonymously for, say, $ 2000.-- and it will not meet any import restrictions in Eastern countries. -Eds.]

VAN DEN HERIK: I'd like to come back to the question of playing strength. Earlier, Dr. Botvinnik, you thought that a computer might be playing better than the human World Champion by this time. That has proved wrong. But when do you expect a computer **will** play at that strength?

BOTVINNIK: When Einstein formulated his Theory of Relativity, he wasn't aiming to test it experimentally himself. That was done by others. I **am** willing to do that kind of thing myself, but it's hard without a computer ... Getting computing time in Moscow is a big problem. We can use the machine on Sundays and at night-time, but that's not the proper time for scientific work.

LEVY: How much computer time are you allowed every month - how many hours?

BOTVINNIK: At present we get sixteen hours per week in all, eight hours on Sunday and eight at night.

LEVY: That's very good.

BOTVINNIK: Ah, but it's a very slow machine. A single tree of variations will take up several hours, perhaps six or seven. Then you'll clear up one bug, and it's a week before you can test it again. You can't work like that. We ought to have a personal computer that goes on the table in front of you and is there to work with at any time. The IBM that we're using executes three or four hundred thousand instructions per second, whereas on the personal computer it would be 2 MIPS.

VAN DEN HERIK: In our program too, there have been a lot of mistakes - programming bugs, but also conceptual errors. What is the type of fault you are dealing with?

BOTVINNIK: Mistakes by the programmers as a rule, but also oversights on my part. But we're not in a position to correct them, because the program was put together in stages, and contains a lot that is redundant - too complicated. It could all have been done much more simply. When we started work on the program, it didn't have a unified algorithm going through from beginning to end. We could now rewrite it from one end to the other, and make it much simpler. But we can hardly undertake this without a personal computer.

LEVY: What can you tell us about other people working on computer chess in the Soviet Union?

BOTVINNIK: People here and there have started working on microcomputer chess. The *Kaissa* team is no longer operating. There was Butenko working in Novosibirsk, but we haven't heard of his progress.

VAN DEN HERIK: In the West we haven't heard anything of Butenko for a long time either. But I'd like to ask you some questions about endgames in computer chess. In our magazine we published an article on two knights against a pawn. Have you seen it?

BOTVINNIK: My colleague Reznitsky is the man who keeps all the periodicals, he reads them all and reports to us about them. But as there's been a crisis in our team - as we haven't got our computer - two of the four mathematicians who were with us have left. Shtilman and Mirny have gone, Shubakov and Reznitsky are carrying on. But they'll go too if we don't get a computer, and the work will come to a stop.

VAN DEN HERIK: Can you give FIDE any advice about the fifty-move rule? Some endgames take more than fifty moves to win.

BOTVINNIK: Some decades ago, the rule said that you were allowed more than fifty moves if it was proved that more moves were necessary to win the position. And of course that's how it should be. But then, it's a rule which only applies to one game in ten or twenty thousand.

VAN DEN HERIK: What do you think of queen and pawn against queen?

BOTVINNIK: I was talking to Grandmaster Matanović about it, just three weeks ago. I asked him what he thought about computer analyses of queen endings, and the analysis of rook endings by Ken Thompson's program. He said these analyses had been scrutinized by masters, and turned out to be full of mistakes. Computers make mistakes as well as humans.
What's more, these computer analyses are of no use to a chess master. They require a vast amount of memorizing, but what a master needs are generalizations, rules.
In 1954, in the Amsterdam Olympiad, I was playing Minev of Bulgaria. We reached an endgame with queen and pawn against queen. I analysed the position until two in the morning, and established a simple rule: the white king has to be on the same rank as the black king, or on an adjacent one. Once I had found this rule, everything was clear to me when I went to resume play in the morning. Minev wasn't aware of the rule. All he knew was the very complicated analysis by Keres. He was armed with stacks of positions

and variations. And Minev very quickly lost. In a case like that, Keres's analysis is as much use as a computer's. A chess master needs to know rules.
Then there was the well-known story of Bronstein adjourning a game at Vilnius against Grigorian. Bronstein telephoned to Moscow, and Donskoy dictated reams of analysis to him. Bronstein put it into operation, and won - because Grigorian threw away the game with an elementary blunder. All the analysis hadn't made a scrap of difference.
This sort of endgame analysis isn't the task that Claude Shannon set himself. The problem, as he saw it, was to understand how to find solutions in original situations - so that the method of searching for a chess move could be transferred to other tasks outside chess. From analysing our queen endgames, we are simply left with an agglomeration of moves, a stock of variations - and this has no bearing on Shannon's problem. But we have now found a general method for using a tree of variations to solve tasks of any kind involving selection problems of economic planning and so on.

[*Later in the interview IGM Raymond Keene posed some questions related to FIDE rather than Computer Chess, which have been excised editorially. When IM Gert Ligterink (Groningen, The Netherlands) joined the session, the following interchange ensued.*]

LIGTERINK: I've heard that you published an interview in some Yugoslav paper, in which you said Fischer was the greatest ever. Is that correct?

BOTVINNIK: That was the journalist's opinion, not mine. It's very hard to give an overall judgement on who is greatest. But I believe there were four masters to whom chess-players are especially indebted.

KEENE: I carried out a large project with Professor Divinsky from Canada. We took 10,000 games from a period of 100 years, all between top-class players, and we thoroughly analysed the results with a computer. The top four were Kasparov, Karpov, Fischer and Botvinnik.

BOTVINNIK: However, those aren't the four that I have in mind. I'm talking about the four who created the "algorithm" for a chess master. First, there was Greco. Four hundred years ago, he introduced combinations into chess. Before his time, there had been no such thing. It was a major step forward. I mean, combinations are bound up with what I have called the second part of a master's positional evaluation.

The second player in question was Philidor, 200 years ago. He drew attention to the assessment of positions that are determined by the pawn structure. The third player was Morphy. He demonstrated positional understanding in open games, where the pieces are mobile and the pawns play a subordinate role. What pawns were to Philidor, pieces were to Morphy. And then Steinitz contributed an understanding of closed positions. Afterwards, all these ideas were developed. But in the last hundred years there has been nothing **fundamentally** new.

ICCA Adopts the Advances in Computer Chess Conferences

The Board of the ICCA have decided to adopt the triennial conferences Advances in Computer Chess, thus assuring their continuity.

For the forthcoming conferences, starting with the sixth one in 1990, Professor Don Beal has been nominated in the Organizing Committee, so as to ensure liaison.