

The Best Chess Computer Yet?

by David Levy (International Master)

and Kevin O'Connell (President of FIDE Zone 1)

Because of our great interest in computer chess we have both given up over-the-board play altogether. In fact, the last serious game that David played against a human being was in the final round of the Buenos Aires Olympiad in late 1978.

During the past year or so we have been involved with a computer project which we find far more interesting and enjoyable than playing the game in international competition. Together with some of England's leading microprocessor programmers, we have been helping in the design and improvement of a chess program that runs on those tiny pieces of silicon which are insinuating themselves in almost every walk of modern life. This is no ordinary chess program — it is clearly the best microprocessor program in the world today (June 1981). We call our program "Philidor".

"Philidor" came into being because we were asked to design a chess program that could go on sale as the strongest microcomputer program in the world. We also wanted a program structure which would lend itself readily to major program improvement in the future and above all, we wanted our program to think like a human being rather than like a computer. We therefore shied away from the "brute force" method in which the program examines the whole of the game-tree to some fixed depth, searching for captures and checks beyond that depth. We decided to make our program more selective in its search of the game tree.

Having taken this important fundamental decision in late March 1980, we put a number of ideas to our chief programmer David Broughton, who had already been writing chess programs as a hobby for a number of years. Linking his previous experience and our suggestions, David started work. That was at the end of May and within about five months the program was already able to play quite good chess. In November

1980 David Broughton discovered that he could no longer make a plus score against his own program, and his rating on the Elo scale is around 1700! The following game shows how well "Philidor" played at the age of only six months. Most of the notes are by the programmer, with a few additional annotations by Kevin.

Queen's Pawn Opening

"Philidor" White
Broughton (Elo 1700) Black

This game started off as a test of new features but quickly developed into a challenge I was not willing to give up.

1 P-Q4 P-Q4
2 N-KB3 P-QB4

I was willing to give up the pawn in the hope that it would try to hang on to it — which it did! Then I was supposed to prove that this was unwise. Trouble was, I'd forgotten the details, except that one tries to undermine the QBP, somehow with the QRP.

3 P x P P-K3

This is probably too early. 3 ... N-QB3 would be better, or even 3 ... P-QR4 first. Getting the pawn back with 3 ... Q-R4ch would have defeated my object.

4 P-QN4 P-OR4
5 P-B3 N-OR3
6 P-K3

All my moves are bad and "Philidor" was proving it to me.

6 ... P x P
7 B-N5ch

I think "Philidor" played only two weak moves in this game and this was one.

7 ... B-Q2 8 BxN PxP 9 PxP N-B3
10 O-O B-K2 11 N-B3 O-O 12 N-K5 Q-B2 13 Q-O4 KR-QB1

I'm still hoping to undermine the QBP.

14 B-O2 B-K1

I had thought of bringing the knight to

Q2 to challenge the knight on White's K5 and also be able to play ... P-B3.

15 P-QR4!

It's either now or never ...

15 ... P-QR4 16 N-N5 BxN 17 PxP PxP 18 RxR RxR 19 BxP N-K1

19 ... N-Q2 is not so good now and I must do something quickly before these pawns get too far advanced. By this time I had given up hopes of winning.

20 P-N6 Q-B1

Where else?

21 R-QB1

Interesting. I had expected 21 R-N1. This allows me to play ... N-Q3.

21 ... P-B3
22 N-B3 N-Q3
23 P-B6

I expected this, of course, and thought I had a way out.

23 ... R-R5
24 Q-N4?

This was the other weak move, though it turned out to be good in the long term. However, I thought I had won material with my next move.

24 ... N-N2!

Yes?



25 N-K1!

Not! Very good indeed. The idea is that if 25 ... BxB then 26 PxN! QxP 27 QxKPch and 28 R-B8ch.

25 ... N-R4

26 P-N7!

"Philidor" now knows it can win material — at least a piece. In fact, it is impossible to avoid complete defeat now, so I resigned.

We began to test "Philidor" regularly against chess computers which were

already on the market. Our own program was being developed on a computer which was somewhat slower than the microprocessor which would eventually be used, so in our tests we had to compensate for this time difference to get a fair comparison. In November 1980 we had not yet added the part of the program that handled the openings, so in some test games we set up a position after the first few moves of the opening, in order to test the middle-game and endgame sections of the program. The following game is one such example. Our opponent was "BORIS 2.5" playing on level 2. The game was played on November 8th 1980. Notes are by Kevin O'Connell.

Ruy Lopez

"Philidor" White Boris 2.5 Black
1 P-K4 P-K4 2 N-KB3 N-QB3 3 B-N5 P-QR3 4 BxN QPxP 5 O-O B-KN5

Since "Philidor" does not yet have a book, the above moves were given to it. Now it is on its own.

6 P-Q3 N-B3 7 P-KR3 BxN 8 QxB Q-O5 9 N-B3 O-O-O 10 B-K3 Q-O3 11 QR-K1 B-K2 12 Q-N3 P-KN3 13 P-B4!

The correct positional decision.

13 ... N-R4 14 Q-N4ch P-KB4
15 PxBP N-B3 16 PxKP QxKP 17 Q-B3 N-Q4 18 PxP NxN 19 Q-N4ch!



"Philidor" is seeing its way through the tactics extremely well apart from missing 18 ... NxN! Now if 19 ... K-N1, 20 B-R7ch winning the black queen.

19 ... R-Q2
20 P-Q4 Q-K5
21 P-N7 R-N1
22 PxN QxBP

22 ... QxQ was correct.

23 B-R6! B-R6
24 R-B8ch R x R
25 P x R(Q)ch B x Q
26 R-K8 mate.

The next month, December 1980, we added a small openings library to the program so that it could take part in a human tournament without disgracing itself in the opening. The first openings book omitted to tell it anything about the Caro-Kann, so it lost one game horribly. "Philidor" competed in one of the 6-round events at the annual Islington congress in London, and scored 2½ points for a performance rating of 1700. (This put it above 80% of all serious human chess players and 99% of all those people who know how to play chess.)

"Philidor" is best game in the tournament; notes by Kevin O'Connell.

Stonewall

A. Bice (1760) White

"Philidor" Black

1 P-Q4 P-Q4 2 P-K3 N-KB3 3 B-Q3 P-K3 4 P-KB4 B-Q2 5 N-KB3 B-N5ch 6 P-B3 B-K2 7 QN-Q2 O-O 8 O-O B-Q3 9 N-K5 P-QN3 10 P-QR4 N-B3 11 Q-B3 P-KR4?

A weak and rather curious move that surprised the programmer and the onlookers.

12 Q-R3 Q-K2 13 P-KN4 PxP 14 NxNP P-N3 15 N-K5 P-R4 16 Q-R6 QR-B1

Although Black has developed all of its pieces, White's position is much better. Black has no active plan to use as a counter to the slow build-up of a king's side attack by White. However, computers do not relax, while humans do ...

17 R-B2? B x N!

This wins at least an exchange. If 18 B Px B N-KN5 and 19 ... NxR.

18 R-N2

White thought that he had a very strong attack after this move and it was the best practical chance.

19 ... B-Q3

19 B x P P x B

20 R x Pch

At this point some of the spectators

began to laugh at the program's poor play: snatching at material and allowing a mating attack — little did they know ...

20 ... K-B2
21 R-N7ch K-K1
22 R x Qch K x R
23 K-B1

Otherwise the black rooks would immediately start an invasion along the open KN-file.

23 ... R-KN1
24 N-B3 R(B1)-KB1!

Building up irresistible pressure against the white king.

25 N-N5 B-B1
26 Q-R3?

This hastens the end, but White was already lost.

26 ... P-K4
27 Q-N3 N-K5
28 N x N

White's best chance was 26 Q-R4, hoping that Black would get lost in the complications after 28 ... NxN. But White was now feeling rather demoralised.

28 ... R x Q
29 N x B B-R6ch

There is no rush to recapture the material — that can wait while Black further improves its position.

30 K-K1 R-N8ch 31 K-B2 R-N7ch 32 K-K1 PxN 33 QPxP PxP 34 P-N3 R x RP 35 B-R3ch

This was White's very last hope, but it was completely crushed by

35 ... N-N5!!

A beautiful move. If 36 PxN R-KN1 37 NPxP dis ch K-B2 and 38 ... R-N8 will be mate.

36 R-Q1 R-KN1

It is mate in two (at most).

White resigns.

This game was impressive not so much because the machine beat the human, even though I believe this is the strongest human any micro has ever beaten in open competition, but because of the manner of the program's victory. White made a serious mistake and was then ground relentlessly (and rapidly) into the dust.

Mr. Bice was unfortunate enough to

fall victim to the program's tactical resourcefulness. Most computer programs are better at tactics than they are at strategic manoeuvring, but in "Philidor" is case we decided at a very early stage that it must be given far more strategic understanding than other chess programs, so that serious chess players would find it equally adept at both aspects of the game. Here is another example of "Philidor" is tactical brilliance; notes by Kevin O'Connell.

Played on 17th February 1981:

Queen's Pawn

"Sargon" (level 4) White

"Philidor" Black

"Philidor" started with the same minimal openings book as at Islington.

1 P-Q4 P-K3 2 N-KB3 P-Q4 3 N-B3 N-KB3 4 B-N5 B-N5 5 B x N Q x B 6 Q-Q3 O-O 7 O-O-O N-B3 8 P-K3 B-Q2 9 B-K2 QR-K1

Black has completed his deployment and is ready for active operations.

10 N-QN5?

Sargon decides to go after Black's OBP. This is a waste of time; he should have been seeking to start operations on the king's side — with castling on opposite sides of the board one would expect to see attacks on opposite flanks.

10 ... P-QR3

Played with full knowledge of what was about to happen.

11 N x P R-B1
12 N x RP P x N
13 Q x QRP

Black has a knight for three pawns, but his position is now far superior, with an lines to attack the white king. Probably no chess program to date would have had even a reasonable chance, though, of successfully building up that pressure and then, at the critical moment, converting it into a tactical reality — now things are different.

13 ... R-R1
14 Q-N7 R-R2
15 Q-N5 R x P

Threatening 16 ... R-R8 mate.

16 P-B3 N x P!!

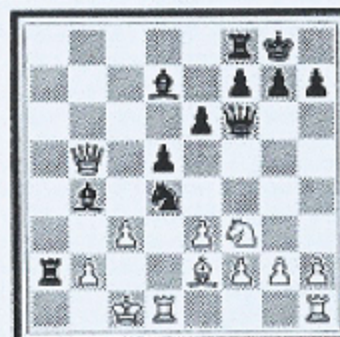
Brilliant! Here are some of the possibilities after 17 QxQB Nx8ch;

(1) 18 K-N1 RxPch! 19 KxR QxPch

20 K-N1 Q-N6ch 21 K-R1 B-B6 mate;

(2) 18 K-B2 QxPch etc;

(3) 18 K-Q2 RxPch 19 K-K1 NxP with an easy win on material and crushing threats of winning more, e.g. 20 R-R1 N-K5 dis ch 21 K-B1 N-Q7ch 22 K-N1 (22 NxN RxN with 2 mating threats) 22 ... NxNch 23 PxN QxP 24 R-KB1 Q-N5 mate.



17 Q x KB N x Bch
18 K-B2

Or 18 K-Q2 NxP again with an easy win on material (19 QxN RxPch). Or 18 K-N1 KR-R1.

18 ... N x P!!

White is hopelessly lost — a piece down and facing a vicious attack.

19 R-R1 B-R5ch
20 K-Q3

The alternatives are no more palatable: 20 K-B1 RxRch, or 20 K-Q2 RxPch! 21 QxR N-K5ch 22 K-B1 R-QB1ch 23 K-N1 N-B6ch 24 K-B1 N-QB dis ch, mating speedily.

20 ... B-N4ch
21 K-B2 Q-N3ch!

White has been run out of moves. All roads lead to mate now.

22 P-K4 R-QB1!

The final nail in White's coffin — all that remains is to bury it.

23 N-K5 QxNP 24 QxN QxKPch 25 N-Q3 BxNch 26 K-Q2 Q-K7ch 27 K-B1 RxR mate.

This must qualify as one of the greatest, if not the greatest, games in the entire history of chess computers. Any strong player (human that is) would have been proud to have played such a game.

There was a time when computer programs had absolutely no strategic chess understanding. During the 1970s, the larger computer programs, running on computers that cost up to several million dollars, began to exhibit a measure of positional understanding, but only when searching trees that contained 100,000 or more positions. Our aim with "Philidor" was to enable it to understand the strategic requirements of a chess position, even when it has only a few seconds for its moves.

To achieve this aim we introduced a totally new concept into chess programming. This concept is one of the industrial secrets of our trade which we are not, at the present time, at liberty to describe or discuss.

We thought this concept was working quite well and we got some delightful confirmation when Kevin gave some German computer chess journalists a sneak preview of "Philidor" during the Nürnberg fair at the beginning of February 1981. Bjorn Schwarz and Iwan Kuhnmond were the first "outsiders" who had the opportunity to sit and play against it. Kuhnmond is a strong player. He eventually won, not without difficulty, and at the end of the game he described "Philidor" as "the first chess program ever with an understanding of basic strategic principles". Schwarz interjected to point out that Kuhnmond was speaking only of micros and surely some big mainframe computer programs had some strategic understanding, but no, Kuhnmond insisted that "Philidor" was the first chess program of any type to be gifted in this way.

The next game was played on board 2 in the fourth round of the 1981 Asian Cities' Team Championships in Hong Kong. A team of "Philidors" was invited to take part, and the company which will make "Philidor" available as a stand-alone computer (Scisys-W, Ltd., of Hong Kong) helped to sponsor the tournament.

Before we went to Hong Kong, many sceptics tried to persuade us that it was foolish to enter such an event with a team of chess programs running on microprocessors. Basing their assertions on the games that they had seen by other commercial chess computers, they predicted that we would probably lose

every game. In fact "Philidor" scored two draws and five wins out of 26 games against the strongest players in Asia. Its performance rating for this event was 1860, an advance of 140 Elo points in 2½ months.

F. Takahashi (Tokyo) is rated about 1900. The notes are by David Levy.

Modern Benoni

Takahashi White "Philidor" Black

1 P-Q4 N-KB3 2 P-QB4 P-B4 3 P-Q5 P-K3 4 N-QB3 PxP 5 PxP P-Q3 6 N-B3 P-KN3 7 P-KN3 B-N5 8 B-N2 QN-Q2 9 O-O R-QN1 10 P-QR4 P-QR3

"Philidor" is doing all the things recommended in Hartston's book on the Modern Benoni yet it has been out of its own openings book since move 7!

11 P-R5	P-N3
12 P x P	R x P
13 Q-Q3	B x N

Not strictly necessary at this point, but in similar positions Black's bishop is less useful than White's knight on KB3, so the trade normally helps Black.

14 QxB B-N2 15 P-K4 O-O 16 Q-K2 Q-B1 17 R-K1 N-K1 18 B-R3 BxN 19 PxP N(K1)-B3 20 B-R6 R-K1 21 Q-B3

Although White has the advantage of two bishops for two knights, there is nothing useful for the bishops to do.

21 ...	P-B5!
22 B-N5	N-K4
23 Q-N2	N(B3)-N5
24 B x N	Q x B

Now White discovers that his white-square weaknesses are going to cost him material.

25 B-K3	N-B6ch
26 Q x N	

Relatively best.

26 ...	Q x Q
27 B x R	Q x QBP
28 KR-QB1	Q-N7

So that White cannot capture either the QRP or the QBP.

29 R(B1)-N1 Q-B7 30 R-QB1 QxKP 31 RxRP QxP 32 B-K3 Q-Q6 33 R-B6 P-Q4 34 R-B7 P-Q5.

Short of time, Black missed the quickest win: 34 ... RxB 35 PxR QxPch.

35 B-R6 P-B6 36 R-R1 Q-B6 37 R-QB1 Q-R4 38 B-B4 P-N4 39 R-B5 P-B3 40 P-R4 P-Q6!

Now 41 R(B1)xP would lose to 41 ... Q-B6, threatening both 42 ... PxP and 42 ... R-K8ch.

41 R(B5)xP PxP 42 RxB 42 RxB PxP 43 PxP Q-K7 44 R(Q3)-QB3 P-B4:

Now 45 ... P-B5 is the threat, and if 46 PxP then 46 ... Q-N5ch followed by picking up the remaining white pawns.

45 R(B3)-B2 Q-B6 46 R-B3 Q-N5 47 K-B1 P-B5! 48 PxP QxRp 49 -B5 QxPch 50 K-N1 Q-Q7 51 -B1 R-KB1ch 52 K-N1 Q-K6ch 53 K-N2 R-B7ch 54 K-R1 Q-KR6ch 55 K-N1 Q-N7 mate.

A number of the Hong Kong games had indicated weaknesses which we wanted to eradicate, and so David Broughton and his colleagues made a number of changes when we returned to London in March 1981 (by now there were six programmers who had devoted some of their time to the project). These changes resulted in further test games, and in various versions of the program being tested against other versions, just to see which ideas worked best in a competitive environment. At one stage we had several prototype computers wandering around the world being demonstrated at consumer exhibitions and to computer chess enthusiasts. Though some of these machines contained bugs in the program the general opinion of the performance of "Philidor" was "outstanding".

Perhaps the most impressive result obtained by the program, was in a friendly game played against BELLE, the current World Computer Champion, at a computer chess conference in London on April 10th. Those of you who have read about BELLE will know that it runs on specially designed hardware and that it has an enormous openings library on disc. The version which its programmer, Ken Thompson, brought to London, did not have the large disc and so its openings book was much smaller than usual; also it lacked the ability to set up transposition tables which are very useful to it, particularly in the endgame. So "Philidor" was not

playing against the very strongest version of BELLE. Nevertheless, Ken Thompson did not expect "Philidor" to have any chance at all. (Notes by David Levy).

"Philidor" (90 seconds per move) White; "BELLE" (45 seconds per move - to compensate for "Philidor" running on hardware that was half the speed of the production version.) Black

Centre Game

1 P-K4 P-K4 2 P-Q4 PxP 3 QxP N-QB3 4 Q-K3 N-B3 5 B-Q2!

A move overlooked by many theoreticians which makes this whole opening quite playable for White. The point of the move is to delay N-QB3 for a moment, so that Black cannot benefit from the pin ... B-N5.

5 ... N-KN5 6 Q-KN3 P-KR4 7 N-QB3 B-B4 8 N-R3 P-Q3 9 O-O-O P-R5 10 Q-B4 B-K3 11 B-Q3 B-Q5 12 N-Q5 B-K4 13 Q-N5 NxRP?? 14 P-KB4! QxQ 15 NxQ BxN 16 KPxB N-N5 17 PxP NxPch 18 PxN N-N5 19 P-K6 N-B7 20 NxP R-R4 21 B-N5 P-R4 22 P-KN4! R-KR2 23 RxP RxR 24 BxR NxR 25 KxN P-R5 26 P-N4 PxP e.p. 27 PxP R-R4 28 K-K2 RxP 29 B-Q8! R-QB4 30 P-Q4 R-Q4 31 BxP K-K2 32 NxP!

White either emerges with a won pawn ending or with a safe passed pawn after 32 ... KxP 33 NxP; but not 32 ... RxP? 33 N-B5ch.

32 ... RxN 33 BxRch KxB 34 P-Q5. Black resigned on move 40.

We have now finished work on the first "public" version of "Philidor", and it will go on sale in Scisys' "CHESS CHAMPION MK V" computer, which will be available in September. This machine has been made as a modular system, so that when stronger versions of the program become available, anyone who has bought the original machine will be able to replace his module with a new one. The playing strength of the program is now around 1900, perhaps slightly higher. But rather than be content to rest on our laurels we are already working towards "Philidor 2".

Now turn over for an entirely different development.

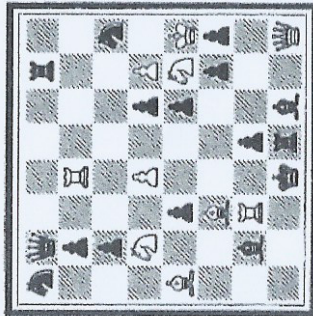
Although most serious chess players are not usually interested in chess problems, there does seem to be a growing interest in the problemists' art, and computers can actually help by determining whether or not a problem is "cooked" (i.e. has more than one solution). For this reason we decided to

teach "Philidor" how to solve mate problems.

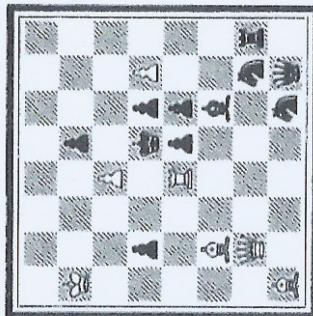
We took ten "White to play and mate in two" problems which Capablanca once solved in a timed test. These problems were published in the *British Chess Magazine* in 1916 (pages 29-30 and 110-111). Capablanca solved all

ten in 21 minutes, which is not bad going for a future World Champion. "Philidor" found the correct solutions in a total of 1 minute 25 seconds! Since this test took place, "Philidor" has been speeded up by some 20%.

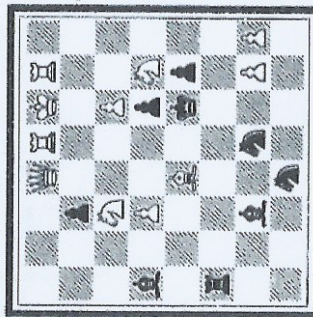
Here are eight of the problems. How long do YOU take to solve them?



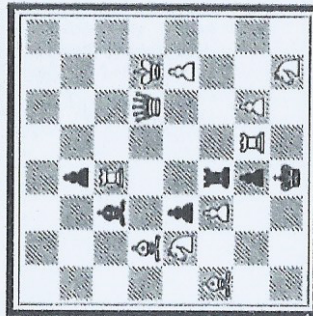
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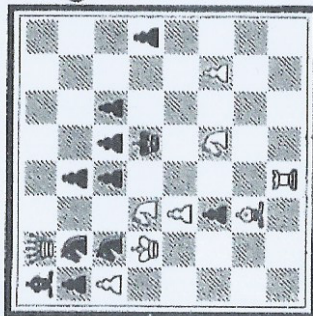
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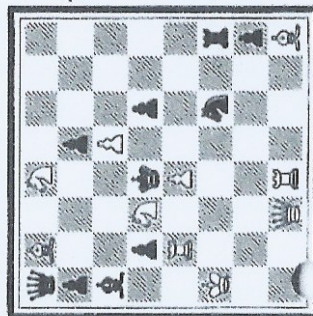
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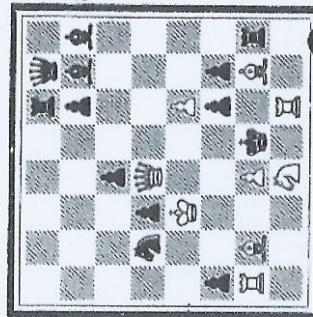
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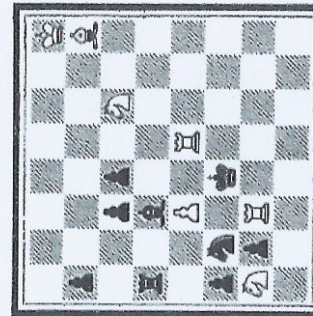
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Solutions: p. 135.

China's women's sensational debut

by Xu Jialiang, former champion of China

The Chinese women's team, making its first international chess appearance at the Olympiad in Malta, caught the attention of the chess world by sharing fifth place out of 42, level with West Germany.

Composed of four girls averaging 19 years of age, they drew their matches with the U.S.S.R. (repeatedly world champions), Romania, Yugoslavia, England and Spain and defeated Bulgaria, Sweden, Canada, India and Japan, scoring 24 points out of a possible 42.

Western chess, like the Chinese chess or "xiangqi", was not officially sponsored as a competitive sport in China until 1956. Until then, the game had been restricted to a very few people in big cities where there was a strong foreign influence. There have always been far fewer women players than men and it was not until 1978 that a national women's Western chess tournament was organized.

No member of the team at Malta had played the game for more than six years. None had any international title. Only Liu Shilian had an Elo rating of 1930, and she acquitted herself well. Among her 14 opponents there were three grand masters and seven international masters. Against the G.M.'s she scored one win, one draw and one loss, and against the I.M.'s three wins, three draws, one loss.

Her best performances were to humble noted Bulgarian G.M. Lemachko in an endgame and draw with the reigning world champion Chiburdanidze.

A student of history at Sichuan University in south west China, she is a pretty, demure lass. She began to learn chess at 12 at a spare-time sports school for children in Chengdu, capital of Sichuan Province. She studied hard. After a loss she used to spend a lot of time finding out why, and where she could have done better. She was among the top six placers in the national junior tournament in 1976, beating several strong boy players. Two years later she finished first, taking the title, and later won the national ladies' title twice.

In May 1979, in her first competition abroad, she teamed up with I.M. D. Vulovic *Yugoslavia* to win the women's team tournament of 33 teams at the Pula Chess Festival in Belgrade. This created a sensation in the European chess world, her team winning all the five matches they played.

A month later in Belgrade, she beat a former Hungarian national champion and several leading Yugoslav players.

The Hyères club in France invited Liu and another young Chinese player, Wu Minqian, to compete in their fourth International Women's Tournament. Liu drew with Soviet G.M. Fatalibekova and Yugoslav G.M. Stadler and defeated the Romanian I.M. Polihroniade. She finished third with 8½ points out of 11. There were 48 entrants from 21 countries. The French press called her a "rising star".

In three international tournaments in 1980, she scored W1, D4, L1 against G.M.s, and W6, D5, L3 against I.M.s.

Her Elo rating stood at 2045 in the F.I.D.E. list of January 1. Her results at Hyères, Malta and Novi Sad qualify her as an I.M.

Wu Minqian's record at the Olympiad was W5, D5, L4. She drew with the Soviet G.M. Gaprindashvili, former world champion, and Hungarian G.M. Ivanka.

As a child Wu learned chess from her father, who came fourth in the 1958 national championships and is now a chess coach at a spare-time sports school for children in Hangzhou city, East China. At 13, in 1974, she learned chess at a spare-time sports school for children, practising the game on her father in the evening after finishing her homework. She studied hard and made remarkable progress. Her play is marked by boldness and an aggressive spirit.

Her Elo rating now stands at 1975.

Seventeen-year-old An Yanfeng, a middle school student in the north China city of Taiyuan, is the youngest on her team. A lively girl, she constantly wears a sweet smile on her face while talking