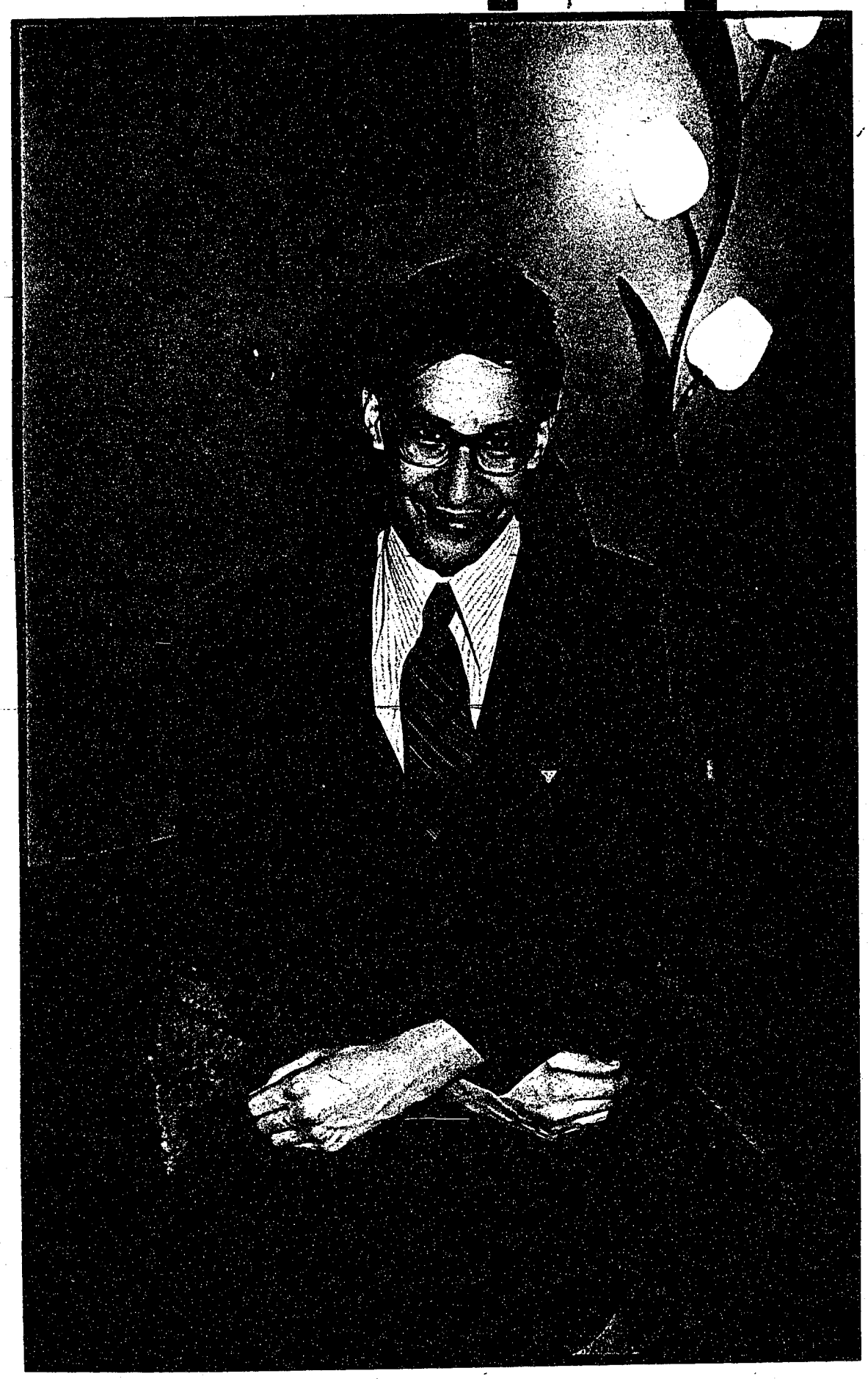
Parent and Child:
The special growing pains of a science whiz

Lord of the Venus flytrap



By Ted Morgan

At the high-rise apartment building on East 76th Street where Francis Barany lives, I asked the uniformed doorman to announce me.

"Is that the kid that won the Westinghouse science contest?" the doorman asked.

"He's one of 40 finalists across the country," I said. "The winner gets a $10,000 scholarship."

"He's a nice kid," the doorman said. "Quiet. I always figured he was an intellectual."

It used to be that precocious youngsters composed sonatas or solved chess problems. Today they confound their elders with breakthroughs in higher mathematics and biochemistry. Francis, a tall and skinny 16-year-old with a long, narrow, bespectacled face that is spotted with acne, is the first to have isolated the proteolytic enzyme which digests captured insects in the Venus flytrap. Perhaps one day it will be known as the F. Barany enzyme.

Mitigating circumstances help explain why Francis Barany is not a dropout, wears his hair short, obeys his parents, has never dropped acid and knows about the counterculture only through hearsay. His mother, Kate, is a chemist, his father, Michael, is a biochemist, and both his parents are research scientists at the Institute for Muscle Diseases. They are trying to find a cure for muscular dystrophy, a fatal disease that strikes only children and teen-agers. Francis's 19-year-old brother George went directly from high school to graduate school, skipping college. He is taking his Ph.D. in protein chemistry at Rockefeller Institute, a rarefied center of higher learning sometimes called the "Nobel Prize farm," which accepts only 25 graduate students a year and has a faculty of 400 and a total student enrollment of 100. Francis travels in fast company.

In the foyer of the Barany apartment there stands a display case with about 20 ribboned medals on the top shelf. I thought at first that Mr. Barany was a war hero, but Mrs. Barany set me straight—the medals had been won at science fairs by her two sons.

Mrs. Barany is a slight, no-nonsense woman with black, bobbed hair, quick gestures and a determined manner. "I gave Francis calculus for breakfast," she joked when I asked her what her influence on her son had been. More seriously, she added: "It is my belief that a parent can do a lot. I always looked for the right toys. I gave George his first science kit when he was 7—on optical illusion. I carefully selected books. I made learning fun. For instance, I showed the kids a pair of scales and asked them to solve a problem —you have eight weights, seven alike and one heavier. You are allowed two weighings to find out which is the heavier weight. I let them think it out. The main characteristic is that we are all scientists devoted to research. We are a very close-knit family."

"My brother and I are always together," Francis said; "he's my best friend."

"That was planned," Mrs. Barany said. "Everything in this respect was planned."

"George was one of her more successful experiments," Francis said.

Mrs. Barany showed me snapshots from the family album—Francis in kindergarten making a magnetic spring, Francis in the first grade making a periscope, Francis beaming in the second grade after his project was selected for the science fair, Francis in the seventh grade working on a project to harness solar energy, Francis in the eighth grade removing $32 from his sneaker after cross-

Ted Morgan, a veteran journalist and frequent contributor to this Magazine, lives in New York City.

ing Central Park on his way home (he had just won the money in a chess tournament) and Francis in the ninth grade standing in front of a display illustrating the nitrogen metabolism of the Venus flytrap.

Francis led me into his room, which is decorated with framed prints of physicians through the ages, and showed me, on a table under a bright lamp, three glass jars containing small green plants with spiked oval lobes, some open and some closed. The Venus flytraps, the plant world's symbol of malevolence, looked remarkably inoffensive.

I think I dropped in Francis's estimation when I confessed that I was not a science writer. He made a special effort to explain things simply. He pointed out three barely perceptible hairs sticking vertically from a trap's lower lobe, took a long forceps with a bit of copper wire between the clamps, and triggered the hairs with the wire. The trap closed. "Now you've had that demonstration," Francis said, very professorial.

"What you can do," he told me, "is take your finger and let the trap close on it. Don't worry, it's perfectly safe; it's not going to bite or anything."

I put the tip of my little finger in and the trap swiftly closed over the choice morsel. I was surprised at its strength and had unpleasant visions of being caught in a Venus flytrap magnified a thousand times.

"It's really a beautiful feeling, isn't it?" said Francis. That was not quite the way I would have put it. "If you had put a fly in there," Francis explained, "the trap would take one or two weeks to digest it. But you fooled it, you put your finger in there and took it right out. It knows it's been fooled, so it will only stay closed from 5 to 24 hours.

"Venus flytraps need a humid environment and a temperature of between 80 and 100 degrees Fahrenheit," Francis went on. "They are indigenous to North Carolina bogs. Interestingly enough, they live in bogs because there is less competition from other plants. But the soil is acid, and they capture insects to make up for the nitrates they are missing.

"The Venus flytrap does a lot of interesting things. It will capture the right-sized insect to fit the trap. As I showed you, it knows whether you're giving it food or not. If you put sand in, which it can't digest, it will also open. One would like to say that it almost has a brain and thinks, but it's more like a biological feedback system. In the Skinner version, it's reacting to outside circumstances. We ourselves have this type of feedback system. Our eyes can direct our two forefingers and make them meet. If we close our eyes, it's not so easy."

I closed my eyes and made my forefingers meet.

"Try doing that over your head," Francis said. I tried and missed.

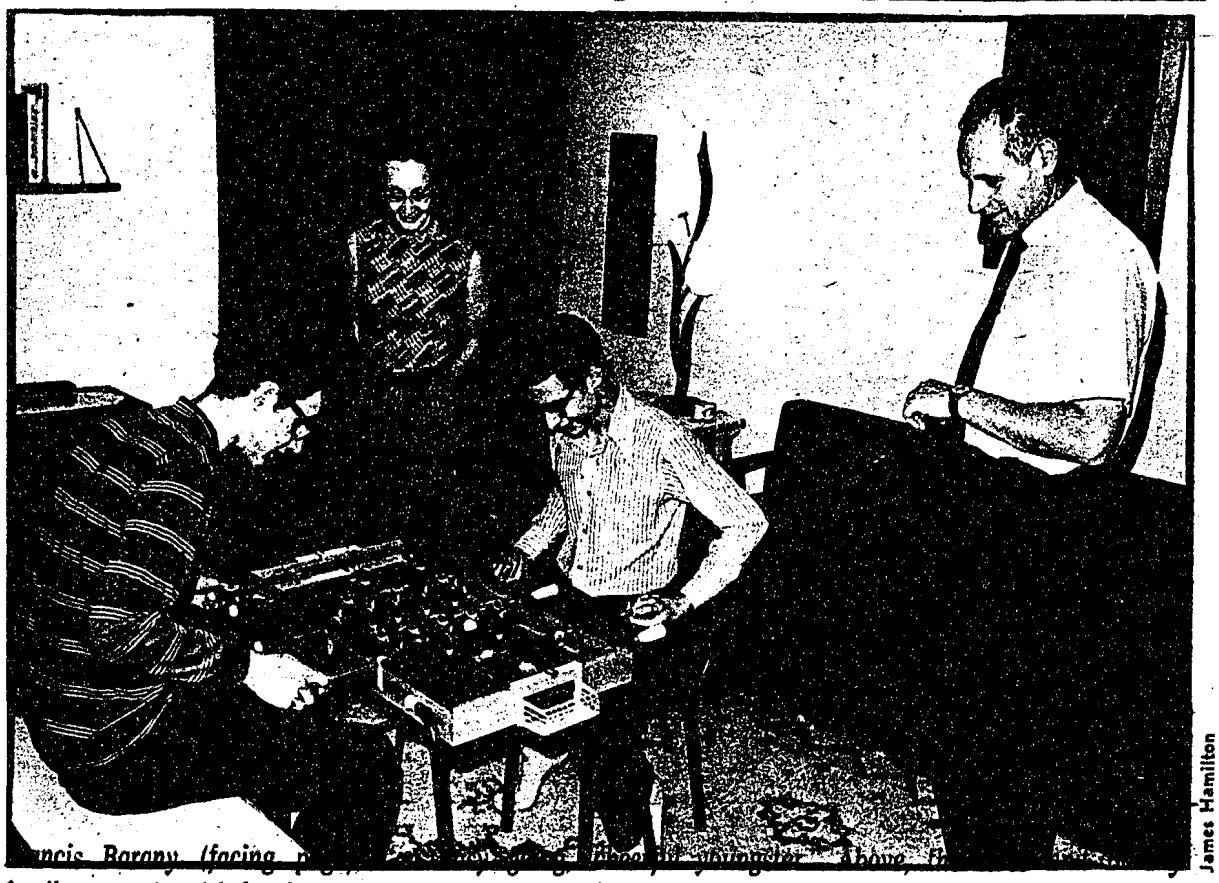
Francis' mother and his brother George came in to see how we were getting along, and when they left, Francis said: "Well, that was a slight transgression."

I asked how the Venus flytrap attracts and kills insects.

"It has alluring cells," Francis said, "which grow right next to the teeth—use the word 'cilia' because 'teeth' is misleading. They attract the insect by (1) secreting a nectar, like flowers and (2) having a smell that insects apparently like. O.K., let's take the sequence: the insect alights on the lobe, it starts to suck the nectar with its proboscis and walks along the surface of the lobe looking for more. It's walking on an angle and, looking for a foothold, it goes for the trigger hair, which activates the trap. The insect is caught and tries to escape by hitting the walls, which stimulates the plant to produce digestive enzymes. The fluids come pouring out. The plant squeezes, it narrows, it almost smacks its lips. The insect dies of suffocation and is digested between the lobes by pure absorption. It completely disappears."

A friend gave Francis a Venus flytrap for his 13th birthday. The quick movement of the trap reminded him of the muscular reactions his parents were working on. He wondered whether the principle was the same. "O.K., what was my plan of attack?" Francis asked rhetorically. "It was like a Sherlock Holmes thing, looking for clues." Finding no signs of muscular contraction, Francis studied the trap's cellular structure under a microscope and found that the middle cells were spongy and the outer cells were hard.

The next step was to measure the tension produced by the flytrap. Francis borrowed a system devised by one of his father's colleagues at the Institute for Muscle Diseases to measure muscle tension. It operates with a polygraph rigged to clamps. (Essentially the polygraph is the same machine that is used for detecting lies; here it is used to translate contractions into electronic measurements.) Francis made a tiny clamp which he fixed to the lobe of a flytrap. The clamp, activated by an electric motor, slowly pulled the closed trap open. The polygraph measured the trap's resistance to being opened, which was translated onto the graph as a zigzagging line. The graph showed that the (Continued on Page 44)



James Hamilton

Francis Barany (facing [illegible]) and his family: Francis with his brother George (on left in both pictures) and his parents, both research chemists.

Science whiz

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trap operated on the same principle as an ordinary spring.

Francis then gathered evidence to show that the trap worked through osmosis: the middle layers of spongy cells received fluids that caused them to expand, creating tension when they pushed against the resisting hard cells. The tension is released when the trap is triggered. Francis also isolated and purified the enzyme that makes it possible for the plant to digest the insect (an enzyme is an organic substance capable of producing chemical changes in other organic substances by catalytic action).

Francis worked on the fly-trap in his spare time, as a hobby. In his more serious moments, he attends Stuyvesant, a science-oriented high school that attracts some of the brightest youngsters in the city. Only one out of eight passes the entrance exam. Other high schools complain that Stuyvesant "skims the cream," leaving them without top-quality students. Stuyvesant is an example of free elitist education in a democratic society. One of the reasons the students there do so well is that they are with their peers. Instead of being held back by less gifted students, they are stimulated by the challenge of other exceptional minds.

Francis is on the first string of the school math team, which is leading the city, and gets up at 7 every weekday to attend its daily practice sessions. "Dedication!" he exclaimed. On the day I accompanied him, I was amazed to see that the classroom where the five-member math team practices was packed. About 30 students had voluntarily come to school at 8 instead of 8:45 to attend, in effect, an extra math period.

"Why is this so popular?" I asked Francis.

"You learn tricks here you don't learn in class," he said.

Francis introduced me to Eric Lander, the valedictorian of the senior class of 700, the captain of the math team, and another Westinghouse finalist, whose paper dealt with quasi-perfect numbers. He has also written a paper giving a geological explanation for the Biblical 10 plagues.

Lander, a tall, slender 17-year-old with a pleasant, open face and curly blond hair, watched as another student wrote a problem on the blackboard: A watch loses 2½ minutes per day—it is set at 1 P.M. on March 15. Let *n* be the positive correction, in minutes, to be added to the time shown by the watch at a given time. When the watch shows 9 A.M. on March 21, n=14/23ds. How many busted watch minutes do you have in the day? "Play with this," Lander said; "we had a lot of fun with it last year." A volunteer came to the board and briskly solved the problem. "Any questions on what he did?" Lander asked. "I mean really. Don't just humor me."

I had no questions. My memory gap was total where algebra was concerned. I was reminded of the cartoon in which two mathematicians are talking and the bubbles over their heads are filled with arcane symbols; in the second panel they are both laughing heartily.

On the way to Francis' physics class, I overheard two students walking ahead of us. Were they talking about a sports event or a TV program? No, they were comparing the relative merits of different brands of pocket calculators.

In physics class, Francis solved a complicated problem involving two stars and a meteorite, and the rest of the class hummed in a mock-heroic manner. Francis told me that he usually got 100 in physics, and "my over-all average has been 95, but last term, because of a sadistic history teacher who gave me 80, it went down. Grades are meaningless; they change with the teacher."

After class, two students came up to me and said: "Would you like to meet two losers of the Westinghouse?"

"You're not losers," Francis said.

"Then where's our money?" one shouted.

"My project was very close to one that was accepted," the other one said, "but they chose someone from another state because they had too many winners from New York."

"If I see you in chemistry, Francis, I'll kill you," the first one said, with a horror-film grimace.

"A little good-natured teasing," Francis confided as we left the classroom.

Abraham Baumel, the chairman of the physics department at Stuyvesant, said, when I asked him to explain what motivates youngsters like Francis and Eric Lander: "Any number of kids here have the intellectual muscle, but what makes the standout? In 24 years of teaching it's still a mystery. I have yet to find a pattern. I'm not even sure what the teacher's role is. With these youngsters you just get out of the way and watch them go."

Baumel subscribes to the theories of L. M. Terman, a pioneer in the study of gifted children. Terman discredited the stereotype of lopsided brilliance, in which advances in one field are offset by backwardness in others. I suppose it is comforting for those of us with average I.Q.'s to believe that a price must be paid for precocity. We take a secret pleasure in stories about brilliant youngsters who did not live up to their promise, like the math whiz who became a small-town accountant, or the piano prodigy who is on the road with a third-rate dance band. But according to Terman, the gifted youngster is gifted in every area. He is better at games, he has more outside interests, he is emotionally more stable, he has more wholesome social attitudes, and he is more trustworthy under the temptation to cheat. Stuyvesant students fit that description, Baumel said. The problems that plague other public high schools, such as drugs, crime and vandalism, are minimal. "Outside the winds are howling," Baumel said, "but this is an oasis of peace."

The teacher can only have a limited understanding of his students, Baumel said, because he does not see them inside the home. "It's like the old joke," he said. "The kid comes home with a 99 and his father asks: 'What happened to the other point?' " A student who was waiting to see Baumel called out from the next room: "My father still does that."

In Francis Barany's development, the family environment was crucial. His parents are Hungarian Jews who were teaching at Budapest University and had to flee after the 1956 revolution. It was a traumatic disruption in their lives. Once a former secret police officer was paid to help them escape, but was arrested. Another time, they were to be smuggled aboard a ship carrying coal from Budapest

Francis Barany and his Venus flytrap exhibit.

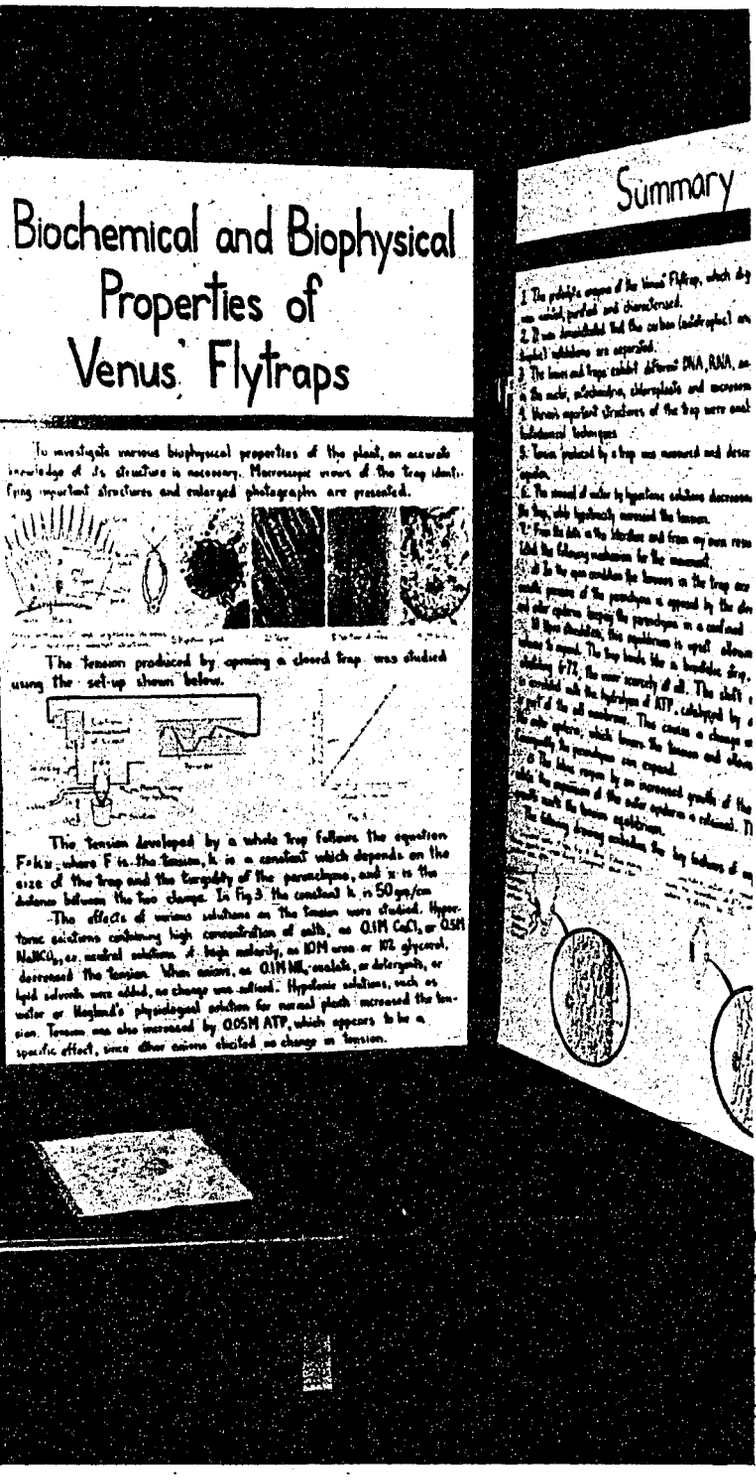
to Vienna, but the Danube froze and the ship was blocked. They finally crossed the border into Yugoslavia with the help of a guide.

Mrs. Barany, pregnant with Francis, carried 2-year-old George in her arms. Mr. Barany carried their two suitcases, one filled with diplomas and the other with food. They were fired at by border guards. From Yugoslavia they went to Israel, where Francis was born, from Israel to Germany, and from Germany to the United States.

To have been a displaced person can breed a permanent feeling of insecurity. The Baranys settled in New York, but uneasily. They found positions in their field of research which made them financially comfortable, but developed few interests outside work and family. Mr. Barany, a model of the ivory-towerish scientist cut off from reality, works obsessively, slipping into the house for a bite to eat and slipping back to his analytical ultracentrifuge machines at the Institute for Muscle Disease. "I sometimes work 20 hours a day," he told me. "I come home for a little sleep. If you have a problem, you want to solve it. I work until I solve it."

"I love research too," Mrs. Barany commented, "but I am a mother first." The Baranys, having done well here because of their academic distinction, transmitted their values to their children. Academic excellence was not only estimable in itself; it was a fortress against the insecurity and confusion of the times.

"The whole family is for science," Mr. Barany affirmed. "Science gives man the high-



est intellectual satisfaction." Neither George nor Francis has ever doubted that assumption. Francis' goal is to become a research scientist. "I would like to add knowledge to the world and alleviate certain kinds of suffering among mankind," he said. "My work with plants is really to learn the methods."

Where Mr. Barany provided an example, Mrs. Barany developed in her sons habits of learning and specific ambitions. "I am always careful that a child should not be bored," she said. "He should be worked up to his full potential." Even recreation had to be purposeful. When Francis went to the ballet, he wrote a report on the performance. When George saw a movie, he rated it in writing from "superb" to "acceptable." As H. A. Carroll, another specialist in the study of gifted children, wrote in "Genius in the Making," the mothers of such children "are in general women of superior intelligence and unusual drive."

Both boys had the natural ability, which was honed and polished within the family circle. "Many teachers didn't want to move as fast as I was moving," Francis said. "I have to thank my mother for taking care of that problem; in the sixth grade she was already teaching me ninth-grade math." George was considered the more brilliant of the two. As a child, he "rediscovered" the Pythagorean theorem (the square of the hypotenuse of a right triangle is equal to the sum of the squares of the two other sides) with a geometric solution. At 16, he passed the Graduate

'Both parents have succeeded in transmitting a value system that Francis and his brother George accept without question.'

Record exam, which is for college seniors who want to qualify for graduate work, and scored 970 out of a possible 990 in math. He is also a tennis champion, which sounds like a *non sequitur*, except as a confirmation of Terman's theories.

Francis had the added motivation of sibling excellence. Going to the same schools, he had to live up to the standard set by his brother. In elementary school, he was runner-up in the spelling bee. "Your brother was the winner," a classmate reminded him. The remark rankled, but instead of turning against his brother, he began to hate spelling. His mother told him: "The boy who made that remark was jealous of you; you must not let jealousy breed jealousy." When Francis came to Stuyvesant, his teachers asked: "Are you as bright as George?" Considering these constant comparisons, there is a remarkable lack of envy between the two brothers. Francis says with complete sincerity: "When George wins something, I'm really proud." George gives Francis credit for helping him make a molecular model with Styrofoam balls and spray paint that won him an international science-fair prize.

Where Francis most sharply deviates from an "American Graffiti" type of adolescence is in his social life. Compared with the "tune in, turn on, drop out" generation, he is hopelessly square. I asked him whether he had ever tried drugs. "Sure, I shoot up every night," he said. "How can you even ask that question? If I said yes, it would be incriminating evidence. I'm well aware of what's going on, but I can honestly say I've never tried a joint. If I tried it, either I wouldn't like it and I'd stop, or I would like it and I'd want more. In either case, there would have been no point in trying it."

Nor has nicotine ever stained his lips. In fact, Francis and his brother, when they were 8 and 11, broke their father of the habit. They clipped newspaper items, wrote him letters, confiscated his cigarettes and put up posters that said: "Any smoking past this point is prohibited—violators will be prosecuted." "We left the man no peace," Francis said, "until he stopped."

"I know what the next question is going to be," Francis said. "Do you drink? Yes, I drink Pepsi on the rocks. Dating? Now you're starting to go into my private life. If you write, 'Oh, this guy doesn't date,' your readers will think, 'So that's what's wrong with him.' They're looking for the chink in the armor. I'll come along to that stage in my life."

Mrs. Barany's firm guiding hand is once again evident here. "They go to parties," she said, "but it is not the purpose of life to go to parties. I give them lots of freedom, but I want to know exactly where they are and when they are getting home."

Although Francis is hardly the typical American teenager, he has much in common with those American gifted children who have been the subject of "longitudinal" studies. In the overwhelming majority of cases, assuming genetic abilities, they come from small families with well-educated parents. The mother has had a determining influence in instilling the will to achieve in her children. Often, although not in Mrs. Barany's case, she is compensating for the frustrations of her social role as a housewife. Both parents have succeeded in transmitting a value system that the children accept without question.

Fitting this pattern, Francis does not stand out as "different" among his classmates at Stuyvesant. He is an easy-going, cheerful youngster who is more often smiling than not. He does not fit the image of the grind, puffy-eyed and pallid of skin from mental self-abuse. He confesses that he is not much of a reader. He likes Scientific American, which he calls "an excellent layman's magazine." He spends afternoons in Central Park with his radio-controlled model car and boat. He invents sophisticated puzzles and games, which he plans to copyright. He was first board on the school chess team, until other obligations forced him into retirement. "As my recreation in terms of sports," he added, "I swim. I'm taking a course to be a lifesaver. I'm not on the football team, but I'm no butterfingers; if you throw a football at me, I'll catch it."

The only criticism his teachers expressed was that "he's very anxious for everyone to know he knows. He's always raising his hand in class." That too is a trait that might be traced to the insecurity of the displaced person. The diplomas Francis is working for are like the approaching shores of his new homeland.

I had a hard time remembering that Francis was only 16. Much of the time he talked like an adult, discussing subjects about which my ignorance was total. Then he would lapse into an adolescent remark, reminding me that I could have been his father, not he mine. I found Francis an improvement over the "typical" teen-agers I see hanging around in clumps and lighting up in front of the high school across the street from where I live, bright where they are sullen and apathetic, endlessly curious where they are caught in the self-contained world of their teen-age jargon and mannerisms. I also found his innocence concerning sex and drugs refreshing in comparison to the "jaded at 15" routine.

Still, there was a form of within-the-family regimentation that I found inhibiting. But this is the special situation of the Barany family. Their home is their castle in the most literal way, since they do not yet seem to have acquired a strong sense of national identity. Their 1956 experience has made them suspicious of all forms of political life. Their work to eradicate a disease that kills thousands of children a year provides a sense of moral certainty they feel is missing outside the laboratory. They have deliberately shut themselves off from the turbulence of American life. The one thing that Francis and George Barany have in common with the children of working-class immigrants is that they are the transitional figures between the old country and the new.

As I was leaving the Barany apartment on 76th Street, we were chatting about working habits. Mr. Barany said that for him there were no weekends or holidays. To which I replied, "I give myself a daily quota and then I stop. I'm very lazy."

Mrs. Barany looked genuinely shocked. "Don't say such things in front of the children," she said. ■