Sports Illustrated article: When a German immigrant named John Hans Feigenbaum (better known by his adopted name, Uelses) flexed a limber vaulting pole and rode its reflex to a 16-foot world record two weeks ago, he set off a violent and uninformed argument about the relative merits of fiberglass, bamboo, steel, and aluminum poles. Not since the Russians used a built-up shoe to break the world record in the high jump has track equipment caused so much controversy.

Most of the argument—on both pro and con sides—was emotional; the vaulters and coaches who used fiberglass poles considered them legitimate. Those who didn't, and who was losing consistently to fiberglass users, maintained the extra flexibility and whip of fiberglass made catapults of the poles and that the vaulters who used them were acrobats and not track-and-field athletes.

In the middle of the uproar, the research laboratory of the Johns-Manville Company offered to settle the question by scientific tests. Johns-Manville manufactures a wide assortment of articles of fiberglass, steel, and aluminum (the conservatives in the vaulting world are advocates of the last two materials), and the company was prepared to determine which pole provided the most lift for the vaulter.

Sports Illustrated accepted the offer and provided the poles (two kinds of fiberglass, steel, aluminum, and bamboo). A SPORTS ILLUSTRATED reporter-photographer team made notes and pictures (below) while Robert H. Neisel, chief of the Johns-Manville materials evaluation section, carried out a three-day-long series of tests.

Astonishingly, the tests revealed that for several years American vaulters have been using the worst possible poles: aluminum and steel. They also showed that fiberglass is an improvement upon, but not a basic modification of, the old bamboo pole and that these two are far superior to the others. Fiberglass is a close man-made approximation of bamboo. Bamboo's disadvantage is that each stick of bamboo has slightly different characteristics. High-density fiberglass poles, on the other hand, may be duplicated precisely.

The Johns-Manville tests were designed to evaluate three capacities of each pole: resiliency, vibration and thrust. In the resiliency test the test poles were placed in a gigantic steel apparatus called a Universal Testing Machine. Each pole was placed on supports 10 feet apart and subjected to pressures ranging from 10 to 60 pounds, which were exerted directly on the center of the pole. **(added comment by Bruce Caldwell Ah the first deflexion machine lol)**

The most resilient pole was the bamboo. At 60 pounds, the bamboo pole bent 7 inches, the fiberglass 6 inches, the aluminum 4 inches and the steel 4 inches. In effect, this means that the same vaulter could put more energy into a bamboo pole than into a fiberglass one and substantially more into either than he could into steel or aluminum. The energy the vaulter expends in bending the pole is returned to him as the pole straightens. Advantage: bamboo; second, fiberglass.

The vibration test showed how quickly each pole returns to its normal shape, i.e., how quickly it gives up the energy the vaulter stores in it by bending it. This test has nothing to do with the pole's catapulting power, but it is important in that it measures the rapidity with which the pole can give forth its energy. This is an indication of how much time the vaulter will have to execute the various maneuvers that make up his technique from the moment he places the pole in the vaulting box until it snaps straight at the peak of his jump. The bamboo pole had much the fastest recoil action, with aluminum the slowest. Fiberglass of the high-density type was faster than steel or aluminum, slower than bamboo. Advantage: fiberglass or bamboo, depending on vaulter's preference.

The third test was for the catapulting, or thrust, characteristic of the poles. The poles were clamped at one end, parallel to the floor, like a diving board, leaving exactly 90 inches free. A

20-pound weight was hung at the free end of the pole, and a two-pound sandbag was balanced on top of the pole. The weight was cut loose and the height to which the pole flipped the sandbag was measured. Under the 20-pound weight and the two-pound projectile, the fiberglass pole dipped 12 inches, then flipped the bag 40 inches into the air. Bamboo dipped 12 inches, tossed the two-pound weight 32 inches. The figures for steel were 9 inches and 26, for aluminum 9 and 23. Advantage: fiberglass; second, bamboo.

In summary, these tests proved that the most efficient vaulting poles are fiberglass and bamboo, with steel and aluminum running a bad third and fourth. When Cornelius Warmerdam set his world record of 15 feet 7 inches in 1942 he was using nature's very good product, bamboo; when John Uelses vaulted over 16 feet he was using what its manufacturer calls synthetic bamboo. If the International Amateur Athletic Federation decides to throw out records set with a fiberglass pole, they should at the same time invalidate the records set long ago by Warmerdam.

Few people, other than some IAAF officials and a handful of coaches and vaulters who do not use fiberglass, want Uelses' record invalidated or the pole disqualified. The most vocal critic of the fiberglass is Don Bragg, who held the world record until George Davies (a fiberglass user) broke it. Bragg grumbled then; when Uelses soared over 16 feet Bragg complained bitterly. "What do they want?" said he. "A circus or an athletic event? The vaulter with the fiberglass pole has the pole do all his work. Speed is no longer of the essence. Nor is strength. Now it's all a matter of coordination."

Uelses, who had been ill with influenza, competed in the Mason-Dixon games in Louisville, fresh from eight days in the hospital at Quantico Marine Base. He failed signally three times at 14 feet. After his third failure the pale, weak Uelses came over to the side of the vaulting pit and smiled weakly. "I guess this proves it is the vaulter and not the pole," he said, with some logic.

Jim Tuppeny, assistant track coach at Villanova who coached Bragg, does not agree with his ex-pupil. Tuppeny is regarded as one of the best vaulting coaches in the country; immediately after Uelses did 16 feet for the first time he sought Tuppeny's help on technique.

Says Tuppeny: "You can't stop progress in sports. Remember the shape of the old footballs? No modern passer would be able to get a grip on those fat round balls. But you don't see asterisks beside the records of Norm Van Brocklin or Sonny Jurgensen."

Tuppeny points out some additional advantages of fiberglass. "A vaulter with a fiberglass pole can grip his pole six inches to a foot higher without taking the shock he would get from the older poles. The fiberglass pole helps a vaulter make a smoother change of drive as he moves from the horizontal approach to the vertical ascent."

With the old, stiffer poles, the vaulter took a tremendous shock in hands and shoulders when he planted the pole in the vaulting box at the end of his run. Much of this shock is now taken up by the easier bend of fiberglass, as it was taken up by the flexibility of bamboo in Warmerdam's day. The energy that was lost in the jarring shock of the steel or aluminum pole against the vaulters' arms and shoulders is transformed into bend in the fiberglass pole and returned to the vaulter as the pole straightens out. Uelses, at the moment, is the man who has learned best the complicated technique involved in utilizing this return of energy. He is by no means the first to work on it. The original fiberglass pole was used by Bob Mathias in 1948. In the 1952 Olympics he set a decathlon record with it. Herb Jenks, the man who produced the first pole, says, "We've been making it for 14 years and nobody said a word. We've sold some 75,000 fiberglass poles. **(Bruce Caldwell comment that is a very exaggerated number lol)** Now all of a sudden, because a couple of guys have done something no one else ever did, they talk about outlawing it."

Imitation bamboo

The Sila-Flex Sky-Pole was a conscious imitation of bamboo. "The structure is similar," Jenks says, "since they both have many lengthwise fibers. We developed the new high-density fiberglass about two years ago, working on materials for nose cones. In the poles 90% of the fibers run lengthwise, with 10% crosswise to hold them together. Then we bind the fibers by impregnating them with plastic resin."

Bragg, incidentally, was given a fiberglass pole by the Sila-Flex people.

" Bragg kept saying fiberglass had advantages but that there wasn't a pole made of it strong enough to hold him," Jenks says. "To shut him up we made one and took it over to his apartment in Van Nuys. He flexed it, looked it all over, and said, 'That's just what I need.' He was going to practice with it and use it. That was before the Compton meet last year. In the meet, he showed up with his metal pole and didn't even place. That was the last we heard from him. I guess he realized there was no magic in it, that you still had to be a good athlete. He probably thought he was too old to start learning a new technique."

Possibly the most expert user of the fiberglass pole until Davies and Uelses was Aubrey Dooley, who taught both of the younger men. Dooley, now a Marine lieutenant, used the pole as an undergraduate at Oklahoma State; he instructed Davies in its use when Davies came to that school, taught Uelses when Uelses came to the Quantico Marine Base.

"My interest in John Uelses was as a teammate at Quantico," Dooley says. "I had worked with the fiberglass pole for over three years, and I felt I could help him with some of the minor points he didn't know—staying on his back as long as possible, delaying his timing to handle the slower reaction of the pole, the knack of keeping his hands apart for better control during the swing and while on top. He made the switch real easy."

Dooley points out another thing that makes Uelses a 16-foot vaulter.

"He has something unique in technique. He leads with his left leg and that lets him stay on his back longer. That keeps his shoulders square, and he can use all of his forward momentum in the swing."

Much has been made of the short run Uelses takes before his vault, and critics of the fiberglass pole maintain that this shows speed is not necessary.

"The reason he takes a shorter run is because that's all he needs to reach his maximum controllable speed," Dooley says. "You check his record, and you'll find he runs the 100 in 9.8, which is comparable to the speed of Bob Gutowski or Bob Richards. If he ran any farther, he'd just be using up energy he needs in the vault itself." Vaulting on the new pole is not difficult, says Dooley. "Anybody can use the fiberglass pole, including Bragg," he says, "if he has what it takes to stay with it and learn."

Uelses has added refinements in technique that are peculiarly his. He is the only vaulter in the world who cocks his pole in reverse. All the rest of the vaulters bend the pole toward the pit; Uelses tries to make his pole bend back toward him, away from the pit.

"I found that out by accident," he said. "The pole bent backward once, and I got a good vertical lift from it. Then I experimented. I found that if the pole bends toward the pit it adds to your forward motion and takes away some of your lift. If you can bend it backward—cock it away from the pit—it tends to throw you back toward the runway. You have forward momentum from your run, and this counteracts the pole and you wind up with a good vertical lift."

Possibly the least surprised person in the country when Uelses cleared 16 feet was Dr. Richard V. Ganslen, professor of physiology and kinesiology at the University of Arkansas, and the world's leading authority on pole-vaulting.

"If an athlete thinks the thing can be done and the record is inadequate, mechanically speaking, he will break the record," Ganslen says. "We've simply had a tremendous psychological evolution in all athletic skills."

As to the pole itself: "Actually, the principle of the flexible pole is nothing new. The bamboo pole was just as flexible as fiberglass, and you didn't see anyone trying to take them away from vaulters like Ozolin of Russia in 1928 or Ohe and Nishida of Japan in 1932. Ohe and Nishida placed second and third in the 1932 Olympics using exquisitely thin bamboo poles especially selected for their flexibility and just as flexible as fiberglass. With the fiberglass pole, the vaulter does less work at the start but must do much more at the end. It's still the man on the end of the pole that counts."