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Arresting Vaulting Pole Technology

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Arresting Vaulting Pole Technology

*Russ VerSteeg**

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In 1972, German Olympic officials perceived that the introduction of new pole technology would have such a detrimental impact on the Olympic pole vault event that they banned the new fiberglass poles at the Munich Olympics.¹ The poles that were banned were clearly and completely legal under the existing rules. The incident in Munich illustrates just how strong the reaction can be to the introduction of new pole technology. The officials who initiated the ban were jeopardizing the outcome of the Olympic pole vault competition itself, their jobs, and their reputations as officials in order to try to prevent new pole technology (or what they perceived to be new pole technology) from affecting the integrity of the sport in Olympic competition. The actions of those officials in Munich were utterly reprehensible and *ultra vires*. Yet that incident illustrates how fervently and passionately even international officials at the

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1. For a good discussion of the Munich Pole Vault debacle, see RICHARD GANSLER, *MECHANICS OF THE POLE VAULT* 66-72 (8th ed. 1973).

highest Olympic level may react in an effort to prevent technology from influencing the outcome of the Olympic Games and the sport in general, even though the pole vault rules clearly permit that to happen.²

The central thesis of this essay is simple. For the sake of safety and for the sake of the integrity of the sport of pole vaulting, rule makers ought to set limits on the advancement of pole technology. In short, rule makers need to arrest the development of new pole technology.³

It is common for the rules that govern sports to evolve. In this regard, rules that govern various sports are analogous to statutory laws that govern various aspects of our daily lives. Legislation, by its very nature, requires periodic amendment, review, and interpretation. Like legislators, rule makers for various sports simply cannot foresee all possible circumstances that may eventually occur. We constantly must adapt sports rules just as we constantly must adapt legislation. There are a number of reasons that necessitate change. One reason is that athletes, like members of society in general, are always looking for ways to improve their performance. Technological advances have affected not only the way that athletes perform, but the ways in which members of society live their lives.

In the non-sports context, for example, technological innovations in transportation, motivated by a desire to move from place to place more quickly and more comfortably, led to changes which have been both gradual and radical. For example, gradual changes in transportation occurred by providing horses with better nutrition and care that incrementally improved their speed. Breeding faster horses also brought about incremental changes in transportation speed. But, revolutionary changes in transportation also occurred with the development of the steam engine, internal combustion engine, and jet engine. As transportation evolved from walking, to horseback, to wagons, to boats, to trains, to automobiles, to airplanes, the laws that govern transportation and transportation safety had to adapt to conform to the changes in transportation. One hundred years ago, there were no laws that regulated automobile

2. See *infra* notes 21-23.

3. In an earlier article this issue was raised. See Russ VerSteeg, *Pole Vault Injuries: Product Liability and Commercial Law Theories*, 5 TEX. REV. ENT. & SPORTS L. 237, 294-95 (2004) [hereinafter VerSteeg, *Pole Vault Injuries*]. This Article expands upon what was merely a brief suggestion in that article, and the argument is developed more fully. In a different article, many of the principal liability issues related to pole vaulting are outlined. See Russ VerSteeg, *Negligence in the Air: Safety, Legal Liability, and the Pole Vault*, 4 TEX. REV. ENT. & SPORTS L. 109 (2003) [hereinafter VerSteeg, *Negligence in the Air*].

traffic speed, turn signals, emission standards, and the like. In addition, there were no laws governing air traffic or airport security that today control the domestic and international flight of airplanes. Technological evolution has triggered the creation and adaptation of thousands of transportation laws and regulations.

This is a common phenomenon in law that is not necessarily limited to transportation. As an additional example, consider copyright law. Until the invention of the printing press, authors and artists typically received financial support from either governments or wealthy patrons who commissioned literary or artistic works.⁴ It was not until an efficient means of copying was invented that authors and artists realized that there was a financial incentive to create multiple copies of their works.⁵ There was no need for copyright legislation prior to the time when technology made replication of literary and artistic works practically feasible (*i.e.*, beyond the labor-intensive act of copying by hand). As members of society sought the means by which to increase the speed, efficiency, and volume of copying literary and artistic works, inventors gradually brought the consuming public one technological marvel after another: moveable type, radio, photography, vinyl disks, motion pictures, television, photocopiers, fax machines, digital computers, satellite dishes, and the Internet.⁶ In the wake of these technological innovations, legislators have had to adapt copyright law as societal expectations and norms have evolved along with the technological changes.

Throughout recorded history, one of the paradigmatic objectives of law has been to respond to technological advancements. The same claim can be asserted regarding the rules that govern sports. For example, golfers have sought means by which to make the ball fly further, straighter, and with a greater degree of control, such

4. See Russ VerSteege, *The Roman Law Roots of Copyright*, 59 MD. L. REV. 522, 530-31 (2000).

5. See *id.* at 525.

6. I am always reminded of the 1977 Xerox Super Bowl television commercial "Brother Dominic:"

Brother Dominic finishes duplicating an old manuscript [by hand], only to learn that the head monk needs 500 more sets. Dominic heads through a secret doorway to a modern-day copy shop where the Xerox 9200 (which can copy at an amazing rate of two pages per second!) does the job for him. He returns to the monastery and delivers the sets in no time. 'It's a miracle,' the father says. Brother Dominic smirks skyward.

ESPN Page 2, *Best Super Bowl commercials*, <http://espn.go.com/page2/s/list/sbcommercials.html> (last visited Nov. 28, 2005). To view the commercial, visit Superbowlads.com, <http://www.superbowl-ads.com> (last visited Nov. 28 2005) (follow the "All-Time" hyperlink).

as making the ball “bite” or hold its position on a green.⁷ Consequently, innovators have experimented with the balls, themselves (including experimentation with the dimple patterns, weight, and size), the shafts of the clubs, and the club heads (including changing the shape, size, composition, and groove patterns, as well as the shapes and weight distributions of the club heads).⁸ As innovators have experimented with these technological changes in an effort to improve performance, rule makers have struggled to respond by articulating more precisely the rules governing balls⁹ and clubs.¹⁰

To be sure, technology has been responsible for a great deal of improvement in performance and safety in many sports. Skiing, baseball, football, hockey, gymnastics, and equestrian sports – just to name a few – have benefited significantly from technological improvements in equipment. Those benefits include enhancements in both performance and safety.¹¹ Many sports have rules that regulate the use of technology associated with implements, equipment, and officiating. Baseball bat composition, the use of the instant replay in football,¹² and the methods of stringing rackets¹³ serve as additional examples.

In contrast, many sports have opted to arrest the development of technology in order to preserve the integrity of the game.¹⁴ For example, in baseball, the professional leagues require wooden bats and prohibit the technologically enhanced metal bats, which are used in youth, high school, and college baseball. There is also a safety concern behind the rule. There have been a number of articles written

7. See, e.g., *Gilder v. PGA Tour*, 936 F.2d 417 (9th Cir. 1991) (preliminary injunction enjoining a PGA ban on U-shaped grooved golf clubs, which give greater control over a golf ball’s spin from the rough).

8. See, e.g., *id.*

9. See 2005 USGA Rules of Golf, R. 5-1, app. III, available at http://www.usga.org/playing/rules/rules_of_golf.html.

10. See *id.*, R. 4-1, app. II.

11. For example, technology has improved the safety and performance of helmets, padding, skis and ski bindings, and playing surfaces.

12. See *NFL Introduces Instant Replay Technology*, NFL NEWS, May 26, 1999, available at <http://www.nfl.com/news/990526replaytechnology.html>.

13. See International Tennis Federation Rules of Tennis, R. 4, available at <http://www.usta.com/rules> (follow “Rules of Tennis” hyperlink) (requiring strict guidelines for racket stringing and materials, articulating specific dimensions, the stringing cannot be less dense in the center than other areas).

14. See PETER M. MCGINNIS, *BIOMECHANICS OF SPORT AND EXERCISE* 7 (2d ed. 2004).

about the increased risk of injury to pitchers and infielders due to the use of metal bats.¹⁵

In the pole vault, many rules govern aspects of the sport, which affect both its integrity and the safety of the participants. These rules relate in one way or another to technology advancements in the sport. For example, there are rules that govern the shape, weight, and length of the crossbar,¹⁶ the design of the box,¹⁷ distance marks on the runway,¹⁸ the allowable depths of the standards,¹⁹ and the composition and dimensions of the pit.²⁰ Yet the rules that govern the structure and composition of vaulting poles are so broad as to almost be non-rules. The International Association of Athletics Federations (IAAF) rule reads, in pertinent part: "The pole may be of any material or combination of materials and of any length or diameter, but the basic surface must be smooth."²¹ According to the National Federation of State High School Associations (NFHS) Rule: "The vaulting pole may be of any material and of any length and diameter."²² The National Collegiate Athletic Association (NCAA) Rule states: "The vaulting pole may be of any material or combination of materials. It may be of unlimited size and weight."²³

As a matter of elementary logic and physics, one would assume that risk of injury increases as vaulters go higher. The higher that a vaulter goes up, the faster he or she descends. But as vaulters have gone higher, landing apparatus have also evolved. Because landing apparatus have gotten softer and bigger concurrently with vaulters attaining higher altitudes, it would be difficult to demonstrate empirically that as vaulters have gone higher, the number and/or severity of injuries has increased proportionately.²⁴ Nevertheless, if the landing apparatus had remained a constant, it stands to reason that as heights increased, the risk of injury also would have increased

15. See, e.g., R. L. Nicholls et al., *A Numerical Model for Risk of Ball-Impact Injury to Baseball Pitchers*, 37 MED. SCI. SPORTS EXERC. 30, 30-38 (2005); R. M. Greenwald et al., *Differences in Batted-Ball Speed with Wood and Aluminum Baseball Bats: A Batting Cage Study*, 17 J. APPLIED BIOMECHANICS 241, 241-52 (2001).

16. International Athletics Association Federation R. 181-7 [hereinafter IAAF]; National Federal of State High School Associations R. 7-5-12 [hereinafter NFHS]; National Collegiate Athletic Association R. 2-6-4, 2-6-5 [hereinafter NCAA].

17. IAAF R. 183-8 and accompanying figures; NFHS R. 7-5-13, NFHS Box Diagrams A and B; NCAA R. 1-5-1 (Figure 7-Pole Vault Box).

18. NFHS R. 7-5-20; NCAA R. 1-5-2.

19. IAAF R. 183-1; NFHS R. 7-5-19; NCAA R. 6-6-6.

20. IAAF R. 183-12; NFHS Rs. 7-5-8, 7-5-9; NCAA R. 2-6-1.

21. IAAF R. 183-11.

22. NFHS R. 7-5-1.

23. NCAA R. 2-6-7.

24. See FRANK RYAN, POLE VAULT 8 (1971).

in some kind of mathematical proportion.²⁵ The speed of acceleration increases because a body falls at thirty-two feet per second squared.²⁶

The advent of fiberglass poles brought a dramatic increase in attainable heights. This is an instance where technology radically changed the nature of the sport itself. Vaulting with a bend in the pole significantly increased the potential height.²⁷

Generally speaking, sports rules perform at least six functions, many of which overlap. Sports rules: 1) define the game; 2) promote safety; 3) prohibit unfair advantage; 4) promote administrative efficiency; 5) foster good sportsmanship; and, 6) promote fairness. Presumably, as sports evolve, rule makers must seriously consider at least two important questions when deciding how to respond to any given technological innovation that affects a sport. They must consider its potential impact on the integrity of the sport (*i.e.*, how it affects both the definition of the game as well as whether it creates an unfair advantage and/or otherwise hinders fairness) and its effect on the safety of the sport. The history of pole vault rules shows a gradual evolution of the “definition of the game” plus attention to safety concerns. This is true especially with the evolution of the poles, box and landing apparatus. This essay examines these rule-making issues as they relate to advancements in vaulting pole technology.

Part I examines the evolution of pole technology and a number of related rules applicable to the pole vault. Part II discusses the most significant improvement in the history of vaulting pole technology, thus far: the fiberglass pole which brought about the dramatic improvements of the “Fiberglass Revolution” in the early 1960’s. The essay concludes in Part III by explaining why an advance in pole technology analogous to the Fiberglass Revolution would be detrimental both to safety and the sport’s integrity, and, therefore, why rule makers must act now to prevent such a dangerous occurrence.

25. For example, this would be true if vaulters were still falling into sawdust pits today.

26. See Jim Carson, *Monday Morning Armchair Physicist*, Jan. 26, 2004, http://www.jimcarson.com/a/2004/01/monday_morning.shtml.

27. See *infra* Part II.

I: THE EVOLUTION OF POLE TECHNOLOGY AND RULES APPLICABLE TO THE POLE VAULT: POLES GRADUALLY EVOLVE FROM HARDWOOD TO BAMBOO TO LIGHT METALS; AND RULES EVOLVE WHICH ENHANCE BOTH SAFETY AND PERFORMANCE

A. Pole Technology

Like baseball, the origins of the sport of pole vaulting are somewhat of a mystery. Presumably, many ancient athletic contests, such as boxing, javelin, and discus had their roots in military training.²⁸ Although there are traces of evidence for people in ancient civilizations using a pole as an implement for jumping,²⁹ the pole vault was not a sport contested for height until the latter half of the nineteenth century.³⁰ Prior to that time, individuals in various parts of the world probably used poles as practical tools to help them cross obstacles such as ditches and streams.³¹

By the 1880s, athletes in the United States were using poles made of hardwoods, such as ash and hickory.³² One of the great chroniclers of pole vault history, Ray Kring, describes the earliest poles as follows:

28. See E. NORMAN GARDINER, *ATHLETICS OF THE ANCIENT WORLD* 2 (1930); W. BLAKE TYRRELL, *THE SMELL OF SWEAT: GREEK ATHLETICS, OLYMPICS, AND CULTURE* 7 (Laurie Haight Keenan ed., 2004); see also WOLFGANG DECKER, *SPORTS AND GAMES OF ANCIENT EGYPT* 70-89 (Allen Guttman trans., Yale University Press 1992) (discussing the history of "combat sports").

29. See GARDINER, *supra* note 28, at 144 ("A pole or spear was used ... in vaulting on horseback . . . but not as far as we know for jumping."); GANSLEN, *supra* note 1, at 131 (describing an ancient Greek warrior, Nestor, who used his spear to jump into a nearby tree; thus escaping danger); Ray Frederick Kring, *An Historical Study of the Pole Vault* 4 (1959) (unpublished Master of Arts thesis, University of the Pacific) (on file with the University of the Pacific Library).

30. Kring, *supra* note 29, at 9. "The first world record holder in the pole leap, or pole vault, was J. Wheeler with a height of ten feet set in 1866." *Id.*

31. See Seamus Ware, *Technological Progress and the Olympic Games*, *JOURNAL OF OLYMPIC HISTORY*, Sept. 1999, at 45-46 ("The origins of pole vaulting go back to prehistoric times, and almost certainly had the practical application of crossing streams or ditches."); SAMUEL WILLIAMS, *THE BOY'S TREASURY OF SPORTS, PASTIMES, AND RECREATIONS* 96 (1847) ("Formerly, in hawking in the woods and coverts, the sportsman carried a stout pole, to assist him in leaping over rivulets. Henry VIII, whilst one day pursuing his hawk on foot, in Hertfordshire, was plunged into a deep slough, by the breaking of his pole."); see also Kring, *supra* note 29, at 5-6 (Describing messengers in the Middle Ages who used "long stout staffs" "to assist the runner in vaulting obstacles in his path-for in those days of poor roads and widespread brigandage, a cross-country route often proved not only quicker, but considerably safer. And here, in the Medieval runner, we find the predecessor of the modern . . . pole vaulter." (quoting RAMY B. DESCHNER, *THE EVOLUTION OF SPORTS* 11 (1946))).

32. See Kring, *supra* note 29, at 19.

The poles used by these early day pioneers in pole vaulting [1890's] were heavy, crude implements. They were made of hickory, white ash, spruce, cedar or some other tough wood. They were from 13 to 15 feet long and 1 ¼ inches thick at the middle, tapering to 1 ¼ inches at the ends. The lower end of the pole was cut off flush to prevent sinking into the earth and shod with a single spike to avoid slipping. The poles were quite heavy, weighing over 10 pounds, and necessitated a slow run-up. These early day competitors were hearty souls indeed.³³

Another notable pole vault historian, Richard Ganslen, cites texts that refer to poles made of fir (1834) and bamboo (some unspecified date before 1875).³⁴ Then, at the turn of the century, we have reliable evidence that vaulters began experimenting with bamboo, although it may have been used earlier.³⁵ Referring to the 1906 Olympic Games, Kring notes that "all the continentals prefer[red] the safer and more pliant bamboo" over "the old fashioned heavy wood pole"³⁶

Discussing the events of 1908, Kring stated that the general use of the bamboo pole during this year was one of the greatest improvements in equipment in the history of the pole vault that greatly improved pole vaulting performance over the next forty

33. *Id.* at 26-27 (citations omitted). Kring continues his discussion by quoting Mr. A.C. Gilbert, the 1908 Olympic champion:

Mr. A.C. Gilbert, early day champion, had the following to say about the poles that were used:

All the early day poles used in pole vaulting were made of hickory, ash, or cedar; in fact my first pole was cedar The cedar pole that I used was taken from a cedar fence and worked down to size by a draw shave. How the ash and hickory poles were manufactured, I do not know definitely, but I understand some of them were actually turned on a lathe. A.G. Spaulding and Bros. was the largest supplier Some of these poles I know were hand made.

With further reference to the implements of early day pole vaulting, there was no box or planting hole used into which the pole was placed in taking-off. As mentioned previously, spikes were placed at the lower end of the pole to grip the ground. With regards to spikes, Gilbert says:

When I first pole vaulted back in Moscow, Idaho with the University boys there, they all used spikes in the pole. No hole was used at the time to the best of my knowledge. Various types of spikes were used – some were turned out of aluminum, some were cast. Some even used, like myself, a large spike that I drove into the pole and then cut the head off.

Id. (quoting Letter from A.C. Gilbert to Author (July 10, 1958) (reproduced in Kring, *supra* note 29, at app.)).

34. GANSLIN, *supra* note 1, at 132-33 (hypothesizing that the vaulting in Japan during the 1870's was done using bamboo without citing actual authority for his supposition: "We like to think that the vaulting done in the Asiatic area was done with a bamboo pole simply because fir, hickory, and ash poles are not indigenous to this area of the world.").

35. *See id.* at 137 ("The idea of using a bamboo pole can readily be traced back ACCURATELY TO 1879 and unofficially to about 1857.").

36. Kring, *supra* note 29, at 45 (quoting F.A.M. WEBSTER, ATHLETES OF TO-DAY: HISTORY, DEVELOPMENT AND TRAINING 231 (London, Frederick Warne and Co. 1929)).

years.³⁷ In his Appendix, Kring reproduced a letter to him written by A.C. Gilbert, a college pole vaulter in the early 1900's.³⁸ In that letter, dated July 10, 1958, Gilbert describes his experience with bamboo:

In 1905, in my sophomore year, there were stories that the Japanese used a bamboo pole. Walter Dray and myself secured some bamboo and we started trying them out. Walter Dray didn't like them and I stuck with it and I improved so fast that all Yale pole vaulters started using bamboo in the intercollegiate games in 1908. Walter Dray, Frank Nelson, Charlie Campbell and myself, with bamboo poles, won all the points in the pole vault. Those games were held at Philadelphia in 1908 although we had been practicing with the bamboo pole two years before that. A protest was lodged against the use of them in those games but was not sustained and when I left with the American Olympic team I brought back from Paris a lot of bamboo and I started the Yale Bamboo Pole Vaulting Company, my first business venture and I sold a great many bamboo poles all over the United States. They then became universal in use until the aluminum pole came into existence. There is no question that it was an improvement in the technique because you could naturally run faster with a lighter pole and you could also handle it much better in making the shift, etc.³⁹

Ultimately, Kring concluded that 1908 was the year in which the bamboo pole became prominent, regardless of when it was first introduced.⁴⁰ In drawing conclusions about the years from 1904-1911, Kring stated:

So ends the 12 foot era in the history of the pole vault, from 1904 to 1911. During this short span of seven years, the world record was smashed eight times by six different men. At no time in history, before or since, has the world record in the pole vault been pushed upward so rapidly. Perhaps one of the reasons for this rapid rise was the introduction into general use of the bamboo vaulting pole. As was pointed out earlier, the bamboo pole was a decided aid to the vaulters of the world.⁴¹

Vaulters continued to use primarily bamboo poles throughout the 1920's and 1930's.⁴² At the time of the Second World War, for obvious reasons, bamboo supplies from Japan became difficult. United States vaulters began experimenting with a variety of metals as substitutes, such as Swedish Steel.⁴³ Then after the War, the

37. *Id.* at 49.

38. *Id.* at 155-57.

39. *Id.* at 155-56 (quoting Letter from A.C. Gilbert, *supra* note 33).

40. *Id.* at 51.

41. Kring, *supra* note 29, at 54. It should be noted that it was during this period that vaulters also began using a hole for planting rather than a spike of the pole's end. Therefore, two major technological innovations contributed to the dramatic increase in heights attained. *See id.* at 48.

42. *See* Iain Macleod, *From Hickory to Fibre-Glass*, ATHLETICS WEEKLY, Apr. 12, 1985, at 33, 35.

43. *See* Kring, *supra* note 29, at 118. It was a Yale man, A.C. Gilbert, that introduced the bamboo pole into collegiate circles, and with all the contributions that Yale University has made to the progress in the pole vault, it seems only fitting that they be the first ones to show this latest advance [*i.e.*, the tapered Swedish steel pole] in pole vault

Harry Gill Company offered a pole made primarily of aluminum.⁴⁴ For the next fifteen years, most vaulters used either light Swedish steel or aluminum poles.⁴⁵

Presumably, the nineteenth century vaulters opted for hardwoods because of their strength. Bamboo offered a significant advantage because it is both strong and lightweight. Perhaps engineers would not have gotten involved in pole design had the war not made bamboo imports scarce. But necessity again was the mother of invention, and once engineers began tinkering, there was no turning back the clock on technology and experimentation. Fiberglass poles were just then beginning to appear on the horizon.

B. Rules

In addition to the gradual evolution of pole materials and technology, other aspects of the sport and rules relating to it also evolved. In particular, improvements in pole plant apparatus significantly increased both safety and performance. Presumably, the earliest vaulters merely drove the pole's end into the ground to initiate a jump. Eventually athletes tried various devices on the end of the pole in an effort to keep it from slipping out from under them at take off. For example, one method was the use of a spike or group of spikes on the pole tip.⁴⁶ According to Kring, spikes at the ends of the poles were used to grip the ground, as there were no boxes or planting holes used when the pole was planted for a jump.⁴⁷ Kring quoted the letter that he received from early twentieth century pole vaulter A.C. Gilbert:

When I first pole vaulted back in Moscow, Idaho with the University boys there, they all used spikes in the pole. No hole was used at the time to the best of my knowledge. Various types of spikes were used – some were turned out of aluminum, some were cast. Some even used, like myself, a large spike that I drove into the pole and then cut the head off.⁴⁸

equipment to the United States. *Id.* at 119; see also GANSLÉN, *supra* note 1, at 138 (discussing the introduction of the aluminum pole in the United States in the 1930's).

44. See Kring, *supra* note 29, at 123 ("During the track and field season of 1950, Robert Richards introduced another new metal vaulting pole, the Giltal Vaultmaster. This pole was made in America by the Harry Gill Athletic Company of Urbana, Illinois, and was made of a special alloy. It was not as small in diameter as the Swedish steel pole but resembled more the old bamboo poles both in performance and shape. It was very flexible and possessed a great deal of action and snap.").

45. See MacLeod, *supra* note 42, at 35.

46. See Ware, *supra* note 31, at 45.

47. Kring, *supra* note 29, at 27.

48. *Id.* at 27 (quoting Letter from A. C. Gilbert, *supra* note 33).

According to Ganslen, “[i]n the early days of pole vaulting there was no such thing as a take-off trough and even today in the professional competitions in England (Rural Meets) vaulters . . . vault with a steel pole with three spikes on its end.”⁴⁹

Around 1900, vaulters began experimenting with digging a hole in which to plant the pole. At this time, the spike at the end of the pole disappeared, as the hole effectively kept the pole in place at takeoff.⁵⁰ A.C. Gilbert’s letter clarified his memory of when the hole was first used:

I haven’t got an exact date, but I think that there is considerable question in my mind who used the hole first. I know we started using it at Pacific University in 1900. We found out later they were using a hole in California and they may have used it in the East. I haven’t done any research on that so I can’t give you the exact information, but that is the approximate date.⁵¹

At the Olympic Games in 1908 in London, Gilbert created quite a controversy when he dug a hole in front of the pit.⁵² “Officials ruled that digging of holes was unethical and illegal. But there was no stopping progress.”⁵³ This is an example of an innovation that turned into an accepted custom, which eventually was adopted by rule makers. In fact, rule makers even standardized the dimensions of the hole, and those dimensions are actually quite similar to the current dimensions of the modern vault box.⁵⁴ Clearly, by planting the pole in a hole, vaulters could vault more safely and more efficiently.

By 1924, the idea of a simple hole in the ground had further evolved into a wooden plant box.⁵⁵ According to Ganslen, “Originally there was only a hole in the ground, then a stop board and finally a bottom and sides were added.”⁵⁶ There has been a continued, gradual evolution of the size, dimensions, and composition of the plant box, but it still serves the same basic function that it did in 1924 – it permits a

49. GANSLLEN, *supra* note 1, at 138.

50. Kring, *supra* note 29, at 35.

51. *Id.* at 36 (quoting Letter from A. C. Gilbert, *supra* note 33).

52. *See id.* at 47-48 (“Gilbert became known as the ‘hatchet man of the London Games,’ when he used a hatchet to dig a pole planting hole at the vaulting pit. The London officials stuck with the old rule of using a spike on the end of the pole. However, the Americans for the past few years had become accustomed to the planting hole and insisted that it was legal.”).

53. RYAN, *supra* note 24, at 7.

54. *See generally* Kring, *supra* note 29, at 71 (“In order to establish some form of uniformity, the N.C.A.A. rule book as late as 1924 carried this note about planting holes: ‘This planting hole should be approximately nine inches deep, eighteen inches wide and should be sloped back to a distance of thirty-six inches.’” (quoting SPALDING’S TRACK AND FIELD GUIDE 29-30 (1924))).

55. *See id.*

56. GANSLLEN, *supra* note 1, at 138.

vaulter to plant the pole without fear of slippage and therefore provides safety and an opportunity for enhanced performance.

The turn of the century also saw another significant rule change. In the late 1800's many vaulters were actually "climbers."⁵⁷ That is to say, they actually raised one hand above the other on the pole, quickly in succession (as if they were climbing a rope) in an effort to climb as high as possible to go over the bar.⁵⁸ In 1889, the American rules prohibited pole climbing; therefore establishing the basic nature of the current sport of pole vaulting.⁵⁹

Through the years there have been numerous technological changes which have altered the sport. Some changes were changes in the poles themselves, while other changes occurred in the ancillary equipment. But, generally speaking, the changes in ancillary equipment – such as the progression of the apparatus for planting the pole (*i.e.*, spikes on the pole tip, digging a hole, and creation of a rigid box), as well as certain other alterations and innovations (*e.g.*, the structure and composition of the pit,⁶⁰ standards, and crossbar⁶¹) have all served a dual purpose. They have all increased both safety and also improved performance.⁶² The same assertion is not necessarily

57. Kring, *supra* note 29, at 9.

58. See *id.* (quoting WEBSTER, *supra* note 36, at 229-30); see also GANSLER, *supra* note 1, at 133-34 (discussing "pole climbing" during its peak in the 1880s).

59. Kring, *supra* note 29, at 22-23. The American rules outlawed "pole climbing," and established the following:

No competitor shall, during his vault, raise the hand which was uppermost when he left the ground to a higher point on the pole, nor shall he raise the hand which was undermost when he left the ground to any point on the pole above the other hand.

Id. (quoting OFFICIAL HANDBOOK OF THE INTERCOLLEGIATE ASSOCIATION OF AMATEUR ATHLETES OF AMERICA 29 (1910) [hereinafter I.C.A.A.A.]); see also GANSLER, *supra* note 1, at 134 ("When the new AAU ruled that the lower hand could not be placed above the upper hand (1889) pole climbing ceased to exist.").

60. See RYAN, *supra* note 24, at 7 ("As vaulters cleared greater heights, landing on the grass became both uncomfortable and dangerous. Landing pits made up of loam, sand, and sawdust were developed. Often these materials were used in combination."); see also Kring, *supra* note 29, at 3 (describing a pit filled with wood shavings).

61. See Kring, *supra* note 29, at 3 (defining the "crossbar" as "[a] bar of wood or metal, which the pole vaulter attempts to clear. The bar is of uniform thickness, either square with beveled edges or triangular in form. If square, the dimensions of the bar shall be 1 1/8 inches in thickness; and if triangular, 1 3/16 inches over each face.").

62. Of course, occasionally, some rule changes result from a desire to alter the nature of the sport without necessarily being related to safety. For example, Kring says:

One rule that appeared in the rule book of that time that is no longer applicable is the following:

A line shall be drawn 15 feet in front of the bar parallel therewith, and stepping over such line, to be known as the balk line, in any attempt, shall count as a balk. Two balks count as a try.

true regarding the advancement of pole technology. Although there may have been some marginal and incidental impacts on safety, the shift from hardwood to bamboo was clearly animated more by a desire to improve performance, rather than a desire to improve safety. This is certainly the case with the later shift to fiberglass. Nevertheless, once a certain level of safety is achieved through a standardization of equipment, athletes and coaches have the luxury of focusing their attention on improvements in technique. This was the case throughout the 1920's and 1930's.⁶³

PART II: FIBERGLASS REVOLUTION: THE INTRODUCTION OF FLEXIBLE
FIBERGLASS POLES IN THE LATE 50'S AND EARLY 60'S RADICALLY
IMPROVES PERFORMANCE VIRTUALLY OVERNIGHT

As was explained in Part I.A., pole technology evolved gradually from hardwoods, to bamboo, to a variety of light metals by the late 1940's and early 1950's. In 1936, the IAAF broadened the scope of its pole rule by allowing poles to be made of materials other than wood and bamboo.⁶⁴ And although no one today seems to be certain of an exact date, by about 1950 some innovators were beginning to experiment with fiberglass poles. In discussing the significant pole vault events of 1950, Kring stated:

Also at about this time, a revolutionary new laminated glass pole was unveiled by a firm in Southern California that was in the business of manufacturing masts of laminated fiberglass for sail boats. These poles became the rage of the country, and the firm was selling them by the hundreds. Their popularity died as quickly as it was born, however, when it was found that the poles were fine when new, but with constant use they became more and more limber until they would snap.⁶⁵

So, although some speculated that fiberglass poles would become important for the future of pole vaulting, it was clear that more research and development would be necessary before the new glass poles would be practical. Furthermore, it is likely that Bob Mathias used a fiberglass pole in the 1952 Olympics.⁶⁶

Fiberglass experimentation continued during the 1950's. In discussing the 1956 Olympic Games pole vault competition, Kring

Kring, *supra* note 29, at 23 (quoting I.C.A.A.A., *supra* note 59, at 29); *see also* GANSLIN, *supra* note 1, at 138 ("Until 1970 it was illegal if the pole passed under the crossbar after a successful vault.").

63. RYAN, *supra* note 24, at 7.

64. *See* Macleod, *supra* note 42, at 33.

65. Kring, *supra* note 29, at 124 ("By 1948 the first fibreglas [sic] poles were available through the Skypole people and a tapered steel pole had already appeared on the American market from Sweden."); *see also* GANSLIN, *supra* note 1, at 138.

66. Ware, *supra* note 31, at 45-46; *see* GANSLIN, *supra* note 1, at 142.

related that one of the important stories had to do with “a fabulous new pole which added inches to the performance of the one man who used it.”⁶⁷ Kring explained that George Roubanis “was using a revolutionary glass pole” which was “[m]ade by a fiberglass concern in California”⁶⁸ The pole is described as “dull yellow”, and it was said that it could “be bent to a ninety degree angle without breaking and possesses tremendous snap.”⁶⁹

Pole vault technology was at a crossroads in 1960. Although none of the United States Olympians used a fiberglass pole in the Rome Olympics, that was to be the last Olympic pole vault competition in which any medal was won by a vaulter using a non-fiberglass pole.⁷⁰ As Ganslen pointed out,

The fibreglass [sic] pole was here to stay and it took sensational jumping by Bragg, Morris, Gutowski . . . and many other metal pole vaulters to delay, ever so slightly, the advent of the fibreglas [sic] pole. In 1961 there was an overall let-down in the vaulting standard as a post Olympic year, but some of the more alert pole vaulters were already beginning to experiment with fibreglas [sic].⁷¹

Lain Macleod recounted the pivotal events of 1961 as follows:

The event was about to change for ever and the experimentations of the US manufacturers following the success of the aluminum pole led to the development of the fibre glass [sic] pole. The new pole required a new technique and that took time to perfect, but at Boulder, Colorado, in May 1961 its potential was finally realised [sic] when George Davies (USA) created his own piece of history by clearing 4.83 to become the first man to break the world record using the revolutionary pole.⁷²

In 1962, the IAAF officially sanctioned the use of fiberglass poles.⁷³ On February 2, 1962, John Uelses, a Marine Corps corporal, vaulted 16 feet $\frac{3}{4}$ inches at the Millrose Games at Madison Square Garden, becoming the first to clear a bar in excess of sixteen feet.⁷⁴ Ganslen describes Uelses as having “opened the door to immortality” by being the first to vault sixteen feet.⁷⁵ After that, unprecedented rapid improvement ensued. First, Finland’s Nikula vaulted 16 feet 1- $\frac{5}{8}$ inches in June of 1962.⁷⁶ Then John Pennel vaulted 16 feet 4

67. Kring, *supra* note 29, at 134.

68. *Id.* at 135 (quoting TRACK AND FIELD NEWS, Dec., 1956).

69. *Id.* (quoting TRACK AND FIELD NEWS, Dec., 1956).

70. See GANSLLEN, *supra* note 1, at 142.

71. *Id.* at 142-143.

72. Macleod, *supra* note 42, at 38.

73. See Kiyoshi Tamura & Yoshinari Kuriyama, *Performance Growth and Technological Innovations in the Pole Vault*, 22 ATHLETICS COACH 2, 6 (1988).

74. See *id.*; GANSLLEN, *supra* note 1, at 143; Macleod, *supra* note 42, at 38.

75. GANSLLEN, *supra* note 1, at 143.

76. *Id.*

inches in 1963.⁷⁷ Next, Brian Sternberg raised the record first to 16 feet 5 inches, and then by June of 1963, raised it yet again to 16 feet 8 inches before a tragic trampoline accident paralyzed him and cut short what surely would have been a phenomenal pole vault career.⁷⁸ By August of 1963, Pennel became the world's first 17 feet vaulter (17 feet $\frac{3}{4}$ inches on August 24 at Coral Gables, Florida).⁷⁹ When the 1964 Olympic Trials were held, Fred Hansen (who eventually won the Tokyo Olympics with a jump of 16 feet 8 $\frac{3}{4}$ inches) had already raised the World Record to 17 feet 4 inches.⁸⁰ Thus, in two and a half years, the World Record improved from Uelses's mark of 16 feet $\frac{3}{4}$ inches set on February 2, 1962 to Hansen's 17 feet 4 inches set on July 25, 1964—an improvement of eight percent.

For world class athletes, the Fiberglass Revolution occurred between 1960 and 1964. The heights increased on an unprecedented scale during the early 1960's. Since 1960, the Olympic Record has continued to increase, going from 15 feet 5 inches (4.70 meters) to 19 feet 6 $\frac{1}{2}$ inches (5.95 meters); an increase of over 4 feet one and $\frac{1}{2}$ inches (1.25 meters) in forty-four years. That is an increase of 26.6%. Similarly, the official outdoor World Record in 1960 was set by Don Bragg on July 2, at 15 feet 9 inches (4.80 meters). Today the outdoor World Record is 20 feet 1 $\frac{3}{4}$ inches (6.14 meters) set by Sergey Bubka on July 31, 1994. That represents an increase of 4 feet 4 $\frac{3}{4}$ inches (1.34 meters) or 27.9% in just thirty-four years. For the sake of comparison, in 1920 at the Antwerp Summer Games, Frank Foss set the Olympic record at 13 feet 5 inches (4.09 meters). Therefore, in the forty years following Foss's record leap, the record improved only two feet (.61 meters) - less than half of the Olympic Record height improvement from 1960 to 2004. That forty year span from 1920 to 1960 saw an improvement of only 14.91%.⁸¹

To add additional perspective, recall that in 1960 Bragg established the Olympic record at 15 feet 5 inches (4.70 meters).⁸² Four years later at the Tokyo Olympics, Fred Hansen obliterated Bragg's mark with a leap of 16 feet 8 $\frac{3}{4}$ inches (5.10 meters).⁸³ That increase (1 foot 3 $\frac{3}{4}$ inches/.40 meters) was the single greatest increase in Olympic records ever recorded in the pole vault. Such an increase

77. *Id.*

78. *Id.*; Macleod, *supra* note 42, at 38.

79. GANSLÉN, *supra* note 1, at 143.

80. *Id.*

81. *See generally*, DAVID WALLECHINSKY, THE COMPLETE BOOK OF THE SUMMER OLYMPICS 351-62 (2004).

82. *Id.* at 355.

83. *Id.*

is incredible. That was an 8.5% improvement in a mere four years.⁸⁴ Then, in 1968, Bob Seagren pushed the Olympic record to 17 feet 8 ½ inches (5.40 meters).⁸⁵ Thus, the Olympic record increased just a hair under fifteen percent (14.89%) in eight years. Note that an increase of 14.89% is almost exactly the percentage of increase in the Olympic Record during the *forty years* from 1920 (Frank Foss 4.09 meters) to 1960 (Don Bragg 4.70 meters)(14.91 %). Although some percentage of the increase from 1960 to 1964 may be attributable to improved training, nutrition, and skill, there is simply no denying that the lion's share of that increase is directly attributable to the use of fiberglass poles.⁸⁶

The reason behind the rapid increase in records is that fiberglass poles provide a distinct mechanical advantage over poles made from other materials. When a pole bends, the ends come closer together, temporarily lowering a vaulter's effective handgrip. As a result, the pole "may shorten its overall length by 15-25%."⁸⁷ Therefore, a vaulter using a fiberglass pole has the potential to raise his or her grip fifteen to twenty-five percent above the height that the vaulter is capable of holding without bending the pole. If all of the other variables remain constant (*e.g.*, the vaulter's speed and technique), a vaulter, theoretically speaking, ought to be able to vault fifteen to twenty-five percent higher using a pole that bends. As Dr. Ryan explained:

Why does the fiberglass pole improve performance so greatly? A quick answer could be, [b]ecause you can hold higher on the pole. It is obvious that the higher you can hold, the higher you can vault. The typical good vaulter who changed from the metal to the fiberglass pole found that his top handhold could be raised at least one foot. In some cases the increase was considerably more.

. . . .

84. In discussing the dramatic improvements wrought by the advent of the fiberglass pole, Macleod notes the difference in heights attained at the Rome Olympics in 1960 as compared to those attained in the Tokyo Games in 1964:

That the fibre-glass [sic] pole had revolutionized the event could be seen in the progress made in the four years since Rome. Don Bragg's Olympic record stood at 4.70, the new world record was 5.28, and the difference was emphasised [sic] by the number of vaulters who broke the old Olympic record and went on to set new ones. The first nine men [*i.e.*, in the 1964 Olympic pole vault competition] all bettered the old record of 4.70; the first 12 equalled [sic] the record and in all throughout the nine hours competition the record was equalled [sic] or bettered on no fewer than 36 occasions. Hansen won the gold at 5.10.

Macleod, *supra* note 42, at 39.

85. WALLECHINSKY, *supra* note 81, at 356.

86. See generally RYAN, *supra* note 24, at 8.

87. GANSLIN, *supra* note 1, at 38.

. . . there is nothing magical about the fiberglass pole. The pole has no energy of its own; it is a temporary storage place. The energy is there only when the vaulter puts it there. He puts the energy in the "bank" and draws it out at the right time.⁸⁸

Interestingly enough, the evolution of the World Record from 1960 to the present supports the mathematical model. As was noted above, the World Record has risen from 15 feet 9 inches (4.80 meters) in 1960 to 20 feet 1 $\frac{3}{4}$ inches (set in 1994) - a 27.9% improvement.⁸⁹ Presumably, some incremental percentage of that improvement can be attributed to improved training, nutrition, and technique; thus, accounting for a figure slightly above the theoretical fifteen to twenty-five percent. Thus, perhaps three percent of the improvement in the World Record from 1960 to 1994 was due to factors other than the shift to fiberglass.

There is no doubt regarding the significant impact of the Fiberglass Revolution on the sport of pole vaulting. "The innovation of the fiberglass pole goes hand in hand with the dramatic increase in pole vaulting performances. The improvement can be accounted for by the manufacture of new excellent vaulting poles and the utilization of modern advanced technologies."⁹⁰ As Lain Macleod concluded:

The pole, of course, remains the significant factor - natural talent excepted - and from the days when heavy hickory poles were the order of the day it has been the development of the pole which has led to the dizzy heights of today. It is all a far cry from the heavy wooden pole used by the pioneering vaulters of the English Lake District in the mid-19th century. Although bamboo poles became the fashion in the early part of this century, in turn being superseded by aluminum poles, it was the transition to fibre-glass [sic] in the late fifties and early sixties that was to revolutionize the event completely.⁹¹

In other jumping events such as the high jump, long jump, and triple jump, there has been no such "revolution." A cursory comparison of the progression of World and Olympic records for those events shows that those records rose on a much more even slope.

In 1920 the World and Olympic Records in the jumping events were as follows:

High Jump (WR 2.01 m/6 feet 7 $\frac{1}{4}$ inches; OR 1.935 m, 6 feet 4 inches)

Long Jump (WR 7.61 m, 24 feet 11 $\frac{3}{4}$ inches; OR 7.60 m, 24 feet 11 $\frac{1}{4}$ inches)

Triple Jump (WR 15.52 m, 50 feet 11 inches; OR 14.92 m, 48 feet 11 $\frac{1}{4}$ inches)

Pole Vault (WR 4.09 m, 13 feet 5 inches; OR 4.09 m, 13 feet 5 inches)

88. RYAN, *supra* note 24, at 18, 27.

89. See WALLECHINSKY, *supra* note 81, at 356, 361.

90. Tamura & Kuriyama, *supra* note 73, at 6.

91. MacLeod, *supra* note 43, at 33.

By 1960 those records had improved to the following:

- High Jump (WR 2.23 m, 7 feet 3 ¼ inches; OR 2.16 m, 7 feet 1 inch)
 - Long Jump (WR 8.21 m, 26 feet 11 ¼ inches; OR 8.12 m, 26 feet 7 ¾ inches)
 - Triple Jump (WR 17.03 m, 55 feet 10 ½ inches; OR 16.81 m, 55 feet 2 inches)
 - Pole Vault (WR 4.80 m, 15 feet 9 ¼ inches; OR 4.70 m, 15 feet 5 inches)
- Forty years later in 2000, the records in those events were the following:
- High Jump (WR 2.45 m, 8 feet ½ inches; OR 2.39 m, 7 feet 10 inches)
 - Long Jump (WR 8.95 m, 29 feet 4 ½ inches; OR 8.90 m, 29 feet 2 ½ inches)
 - Triple Jump (WR 18.29 m, 60 feet ¼ inches; OR 18.09 m, 59 feet 4 inches)
 - Pole Vault (WR 6.14 m, 20 feet 1 ¾ inches; OR 5.92 m, 19 feet 5 inches)

Therefore, the improvements during those successive 40-year periods are:

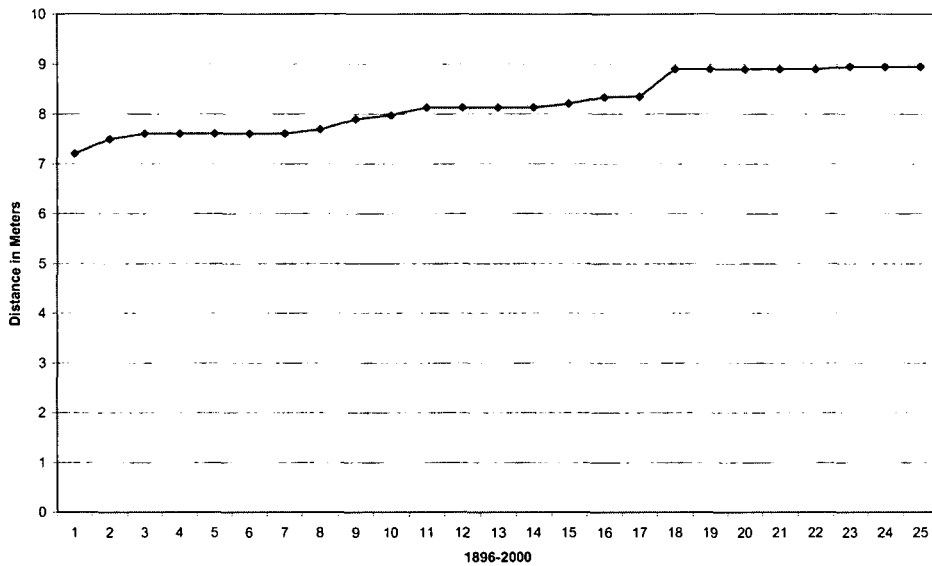
A) 1920-1960

- High Jump WR + .22 m/8 ½ inches (10.9 % increase)
- High Jump OR + .225 m/9 inches (11.6% increase)
- Long Jump WR .60 m/1 foot 11 ½ inches (7.9% increase)
- Long Jump OR + .52 m/1 foot 8 ½ inches (6.8% increase)
- Triple Jump WR + 1.52 m/4 feet 11 ½ inches (9.7% increase)
- Triple Jump OR + 1.89 m/6 feet 2 ¾ inches (12.7% increase)
- Pole Vault WR + .71 m/2 feet 4 ¼ inches (17.4% increase)
- Pole Vault OR + .61m/2 feet (14.9% increase)

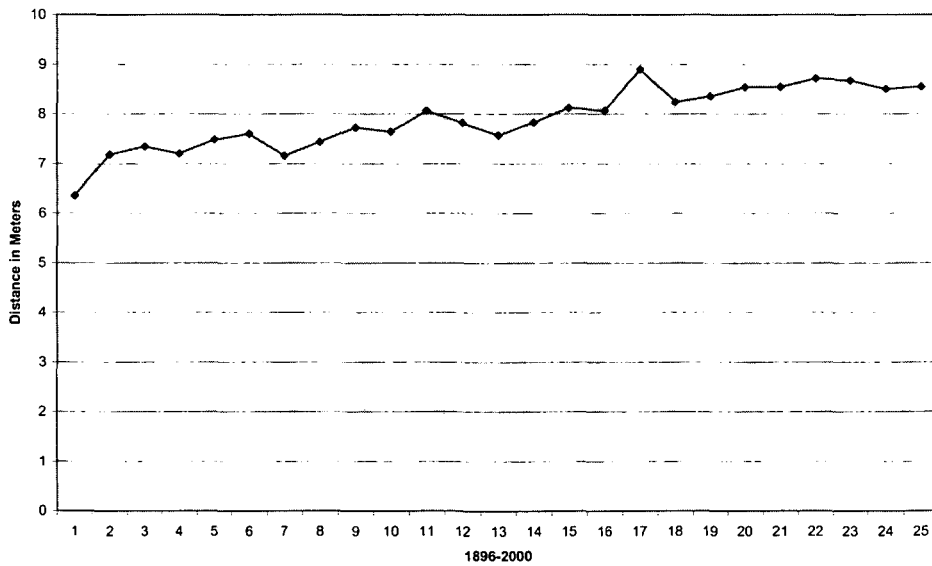
B) 1960-2000:

- High Jump WR + .22 m/8 ½ inches (9.9% increase)
- High Jump OR + .23 m/9 inches (10.6% increase)
- Long Jump WR + .74 m/1 foot 5 ¼ inches (9.0% increase)
- Long Jump OR + .78 m/1 foot 6 ¾ inches (9.6% increase)
- Triple Jump WR + 1.26 m/4 feet 1 ¾ inches (7.4% increase)
- Triple Jump OR + 1.28m/4 feet 2 inches (7.1% increase)
- Pole Vault WR + 1.34m/4 feet 4 ½ inches (27.9% increase)
- Pole Vault OR + 1.22m/4 feet (26%)

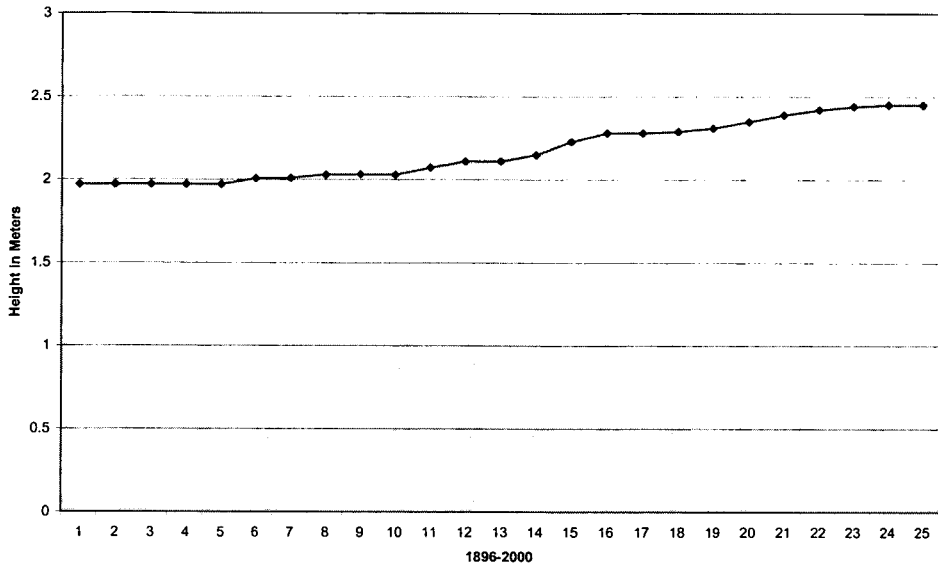
World Long Jump Record



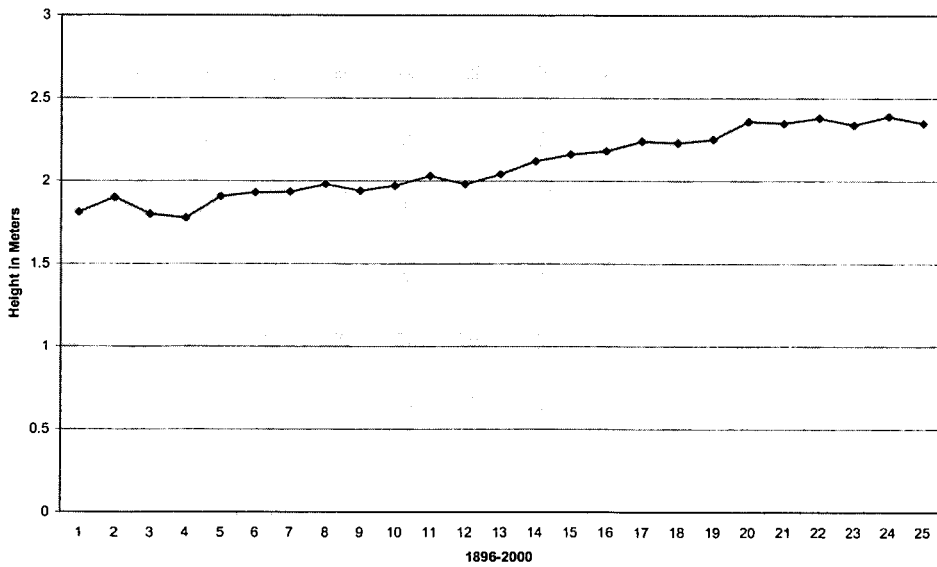
Olympic Long Jump Gold Medal



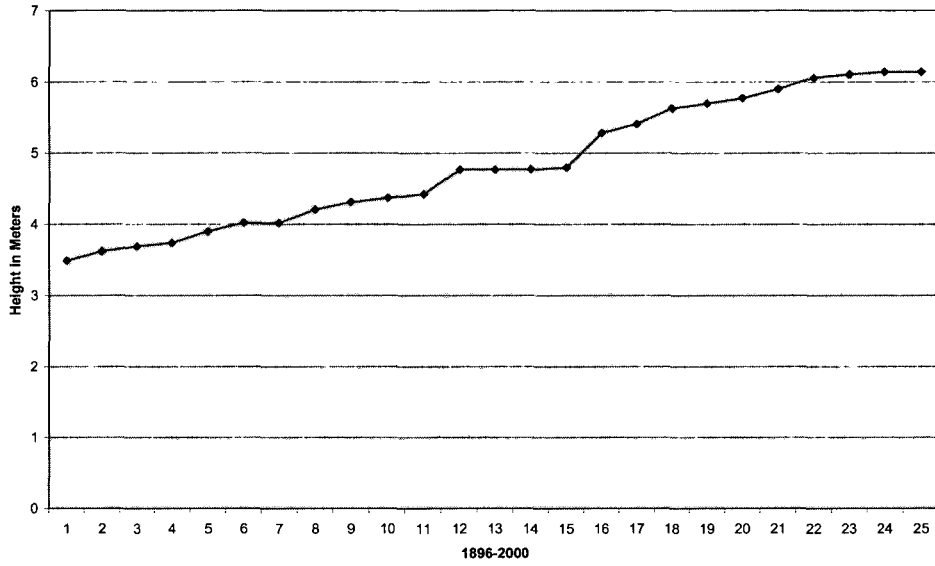
World High Jump Record



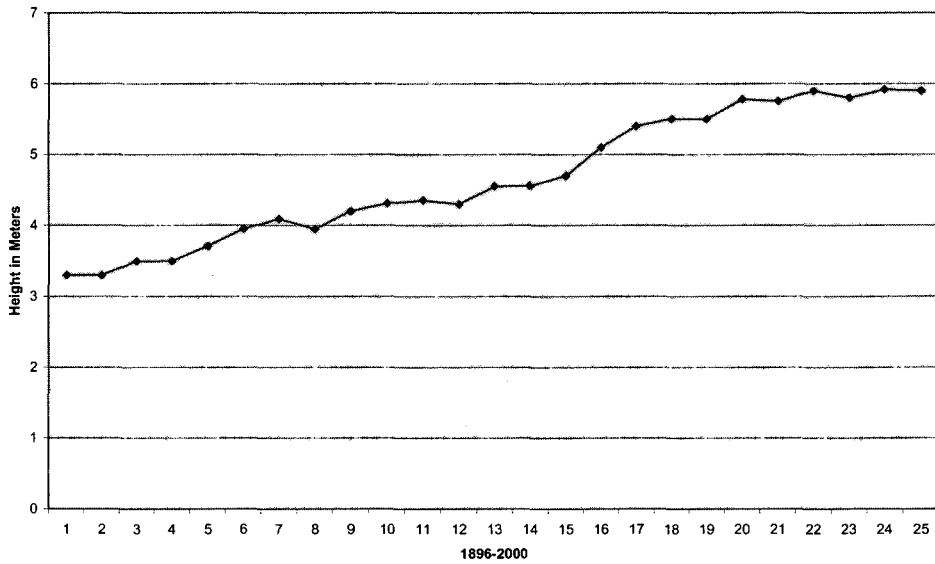
Olympic High Jump Gold Medal



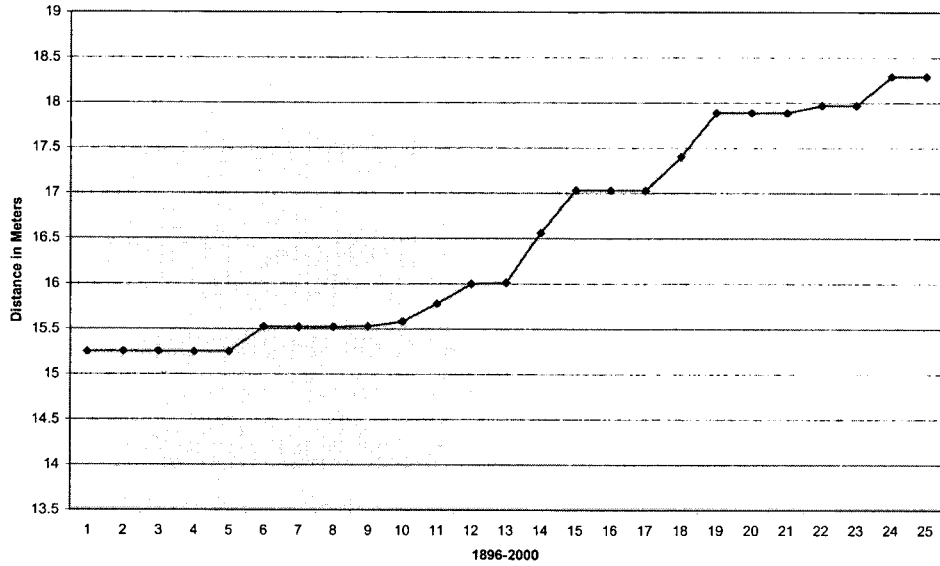
World Pole Vault Record



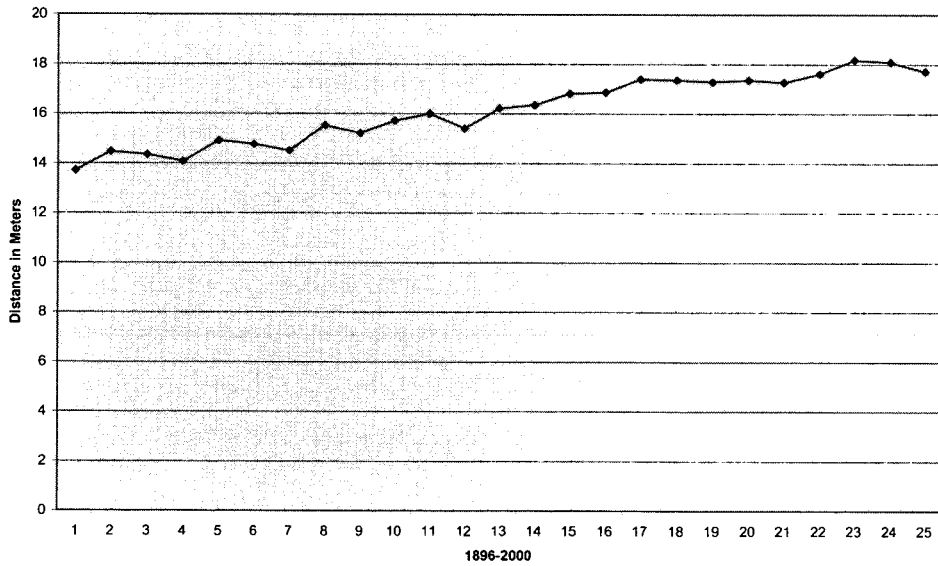
Olympic Pole Vault Gold Medal



World Triple Jump Record



Olympic Triple Jump Gold Medal



This comparison makes it clear that technology has had less of a dramatic impact on the high jump, long jump, and triple jump. Although improved runways and shoes have probably contributed to gradual improvements in all four events, there is nothing analogous in the other jumps to the sudden impact of the shift from rigid poles to flexible poles. Even Bob Beamon's sensational leap in the 1968 Mexico City Olympics (which, in an unthinkable blink of an eye, raised the World Record from 8.35 m/27 feet 4 $\frac{3}{4}$ inches to 8.90 m/29 feet 2 $\frac{1}{2}$ inches) only improved the long jump record by 6.6%. And that jump was such an aberration that it still stands as the Olympic record today.⁹² Recognizing the extraordinarily exceptional nature of Beamon's record, it must be admitted that, as a rule, it is the norm in the jumping events for records to increase incrementally, resulting from improved nutrition, training, and technique. Given that incremental improvement is the norm in the jumping events, when considering merely the integrity of the sport of track and field, arguably it should be preferable for improvements in the pole vault to come from improved nutrition, training, and technique also, rather than as a result of improvements, which can be attributed to an engineer's new pole design or radical change in pole composition.

III: CONCLUSION: WHY AN ADVANCE IN POLE TECHNOLOGY ANALOGOUS TO THE FIBERGLASS REVOLUTION WOULD BE DETRIMENTAL BOTH TO SAFETY AND THE SPORT'S INTEGRITY, AND, THEREFORE, WHY RULE MAKERS MUST ACT NOW TO PREVENT SUCH A DANGEROUS OCCURRENCE

Under present circumstances, there is something of a natural learning curve for those who learn how to pole vault. Younger, less experienced vaulters are unable to vault as high as older, more experienced vaulters. Therefore, there is proportionately less risk involved for inexperienced vaulters.⁹³ On the other hand, more experienced vaulters are generally better able to control their actions and thus reduce their risk of injury. Experience teaches vaulters greater body control and the skills needed to successfully negotiate

92. Of course Mike Powell is the only man who has ever jumped further, setting the World Record of 8.95 m 29 feet 4 $\frac{1}{2}$ inches on August 30, 1991 (22 years 316 days after Beamon's jump in Mexico City). Since no one broke Beamon's Olympic Record in Athens in 2004, it is clear now that Beamon's Olympic Record will last at the very least 40 years. See USA Track & Field, Mike Powell, http://www.usatf.org/athletes/bios/oldBios/2001/Powell_Mike.asp (June 6, 2001).

93. See RYAN, *supra* note 24, at 39.

dangerous situations as they occur in the air. For example, experience itself may benefit vaulters when they plant under (i.e. when the takeoff foot strikes the runway closer to the horizontal plane of the back of the box than the vaulter's top hand) and get rejected (i.e. when the vaulter's momentum is insufficient to cause the pole to rise to vertical and instead results in the vaulter being thrown backwards toward the runway) or stall out (i.e. when a vaulter's momentum is insufficient to cause the pole to rise to vertical and instead results in the vaulter being suspended momentarily in mid-air). That experiential difference must be factored into any risk analysis. Thus, with more experience comes more height, but also a greater risk of injury.

The sport is sufficiently dangerous now with the improved technology of fiberglass poles.⁹⁴ Another technological revolution on an order of magnitude analogous to the Fiberglass Revolution could have devastating effects on the safety as well as the integrity of the sport. Going higher is what this sport is all about, but height increases should result from superior skill and training, not, as a rule, from advances in technology. To be sure, there will always be marginal improvements that result from technology on limited levels, such as improvements in nutrition, track composition, lighter spiked shoes, and the like. The sport of track and field accommodates improvements such as starting blocks⁹⁵ and all-weather track surfaces, and those improvements, have been accepted and adopted.

However, rule makers have rejected other technological advances because they provide an unfair advantage.⁹⁶ An obvious example is the ban on certain performance-enhancing substances, such as anabolic steroids.⁹⁷ Rule makers have taken the position that steroid use is potentially injurious to participants and that its use artificially enhances performance. Arguably, any new or significant advancement in pole technology analogous to the Fiberglass Revolution would also have the potential to share these same negative effects—to cause injury and to artificially enhance performance.

94. See generally VerSteege, *Negligence in the Air*, *supra* note 3, at 109-11 (describing three fatalities that occurred in 2002 and numerous other catastrophic injuries from the 1980s-1990s).

95. See Tom E. Parry et al., *Lateral Foot Placement Analysis of the Sprint Start*, *Master Track & Field News* #112 (April 29, 2003), available at <http://www.evaa.nu/DOCUMENT/dunton/2003/trainin17.html> ("starting blocks were introduced in 1928-29 to facilitate more reliable starting in the sprint events").

96. See, e.g., *supra* notes 7-10 and accompanying text.

97. See generally E. Tim Walker, *Missing the Target: How Performance-Enhancing Drugs Go Unnoticed and Endanger the Lives of Athletes*, 10 VILLANOVA SPORTS & ENT. L.J. 181 (2003).

I am not suggesting that we turn the clock back to the days of bamboo and Swedish steel. Clearly the Fiberglass Revolution is water under the bridge. However, it would be imprudent to fold our hands and acquiesce without seriously questioning whether the sport ought to allow another radical leap in pole technology that could produce results similar to those produced by the Fiberglass Revolution. It must be assumed that engineers and innovators are hard at work seeking ways to develop new pole technology that will have as dramatic an effect on tomorrow's pole vaulters as did the Fiberglass Revolution in the 1960's.

It is time for the IAAF, USATF (U.S.A Track and Field), NCAA, and NFHS to change the rules which permit poles to be made of any material or combination of materials.⁹⁸ We must arrest pole technology for the sake of safety and for the sake of the integrity of the sport. Presumably, in order to write such a rule, rule makers will need to examine the means by which to restrict 1) the materials (fiberglass, carbon); 2) the manufacturing process; and 3) the design (wrapping, sail piece, etc.) of poles. In addition, it will probably be prudent to establish a sunset date after which no new pole technology would be permissible without prior approval.

The following may serve as a basis for beginning the discussion of a text for such a rule. The vaulting pole may be made of wood, metal, fiberglass, carbon, or any combination of those materials. It may be of any length, weight, or diameter, but the basic surface must be smooth. Only materials and technology which were available on the market as of December 31, 2005 may be used. Any new, useful, and non-obvious invention and/or improvement to pole materials or pole technology after that date must be first approved by the Rules Committee of the IAAF, (NCAA, NFHS) in order to be considered legal.

If rule makers freeze the allowable pole technology, coaches and athletes will have the freedom to concentrate their efforts on improving their strength and skills, rather than fretting over whether they have the latest in pole technology. Such a rule will enhance safety and preserve the integrity of the sport. The focus will be on the athletes rather than the equipment.

98. See *supra* notes 21-23 and accompanying text (describing broad rules proscribing the composition of poles currently allowed).

