

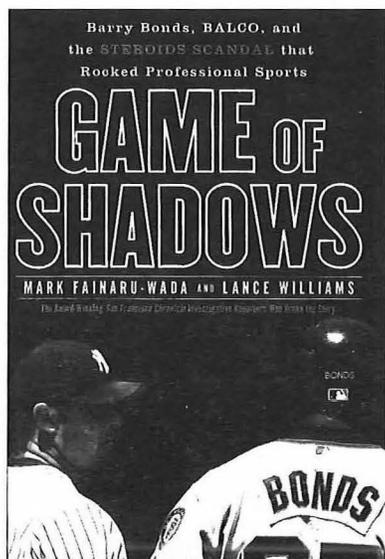
Size Matters: Reflections on Muscle, Drugs, and Sport

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Editor's Note: Each year at the annual meeting of The North American Society for Sport History (NASSH) a member is asked to deliver a special honor address—NASSH's equivalent of the keynote speech given at other conferences. For the 2008 conference, Jan Todd was asked to deliver the Seward Staley Honor Lecture, and the article which follows is the text of her speech. When she delivered this lecture to several hundred international scholars in Lake Placid, New York, on 24 May 2008, Jan illustrated the talk with a PowerPoint presentation containing 87 slides. Space doesn't permit us to use all of the images she showed the audience, but we are including more pictures than normal since the argument she is making is based on visual evidence and interpretation. Although this lecture was prepared for presentation to NASSH, we hope IGH subscribers will be interested in her discussion of the connection between baseball star Barry Bonds and a misunderstanding of bodybuilding history.

In the closing pages of *Game of Shadows*, the 2006 book on Barry Bonds and the BALCO scandal, the book's authors, Mark Fainaru-Wada and Lance Williams, include an appendix containing additional evidence they believe proves Barry Bonds was an anabolic drug user. "The belief that changes in Bonds' body



Game of Shadows was written by San Francisco Chronicle reporters Mark Fainaru-Wada and Lance Williams after several years of investigative reporting.

reflect steroid use," they write, "is supported by the research of Harvard University psychiatrist Harrison Pope, an expert on the mental-health effects of steroid abuse." Pope and his colleagues, they explain, published an article in *The Clinical Journal of Sports Medicine* in 1995 that contained "a mathematical formula for use in determining whether a person used steroids." The formula, called the Fat Free Mass Index (FFMI), "predicts steroid use

from a series of computations involving the subject's lean muscle mass, which is determined from height, weight and percentage of body fat."¹ Fainaru-Wada and Williams go on to explain that according to Pope's article, the higher the Fat Free Mass Index, the more likely that person is to be using anabolic drugs. An average, non-obese college student would score about 20 on the FFMI, they explain.

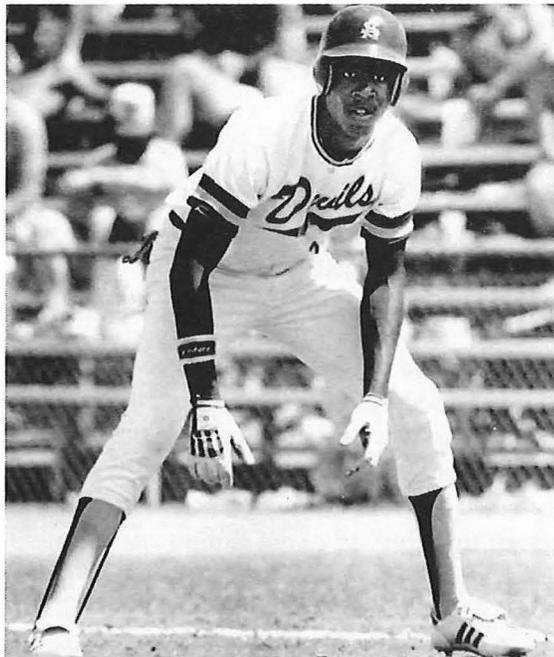


Steve Reeves' body, as it looked in 1947 the year he won the Mr. America Contest, should be considered as an example of the upper limit of muscularity possible without using steroids, according to Dr. Harrison Pope and his colleagues.

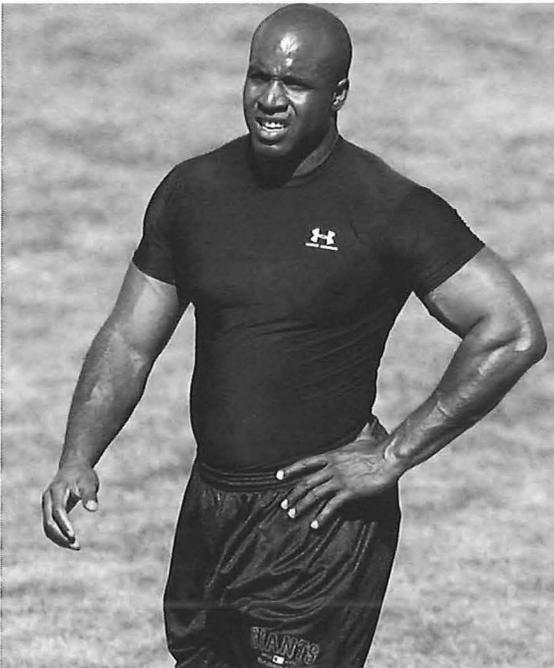
The former Mr. America Steve Reeves, cited in the article by Pope and his colleagues as the “most famous muscle man of the pre-steroid era,” and, to quote Pope directly, “as an example of the upper limit of muscularity that we believe can be attained without drugs”—was a 25.7 according to Pope.² So confident is Pope of his formula that he wrote in 2000, “*Any male scoring 26 or higher who is not visibly somewhat fat, and claims that he has achieved this physical condition without the use of drugs . . . is almost certainly lying.*” [Italics in original]³

When Fainaru-Wada and Williams read this strong statement from one of Harvard’s best and brightest, it’s not surprising that they felt comfortable using Pope’s formula to shore up their contention that Barry Bonds was a drug user. After all, Greg Anderson, Bonds’ personal trainer had self-servingly boasted that he’d helped Bonds achieve a body fat reading of 6.2 percent in 2002, when the home run king weighed 228 pounds. These numbers, factored into the formula, gave Bonds a reading of 28 on the FFMI, a reading Fainaru-Wada and Williams argue is “well-over the level of a ‘presumptive diagnosis’ of steroid use.”⁴

When I encountered these claims in *Game of Shadows*, I was at first surprised and then increasingly concerned about what I was reading. It wasn’t that I believed Barry Bonds to be innocent of steroid use. On the contrary, the weight of evidence suggests that Bonds probably did use anabolic agents—knowingly or



As a minor league player in the early days of his career, Barry Bonds weighed about 185 pounds at a height of 6’2”.



In 2002, Bonds weighed 228 pounds and, as can be seen in this photo, had added considerable muscle to all parts of his physique.

unknowingly—in the latter part of his career.⁵ What upset me was the blind faith that Fainaru-Wada and Williams and a large number of journalists and other individuals are placing in Pope’s formula and the data and assumptions on which the formula itself is based.⁶

It’s normal, of course, to embrace new tools that appear to make life simpler. Wouldn’t it be nice, as Pope and his colleagues suggest, if the formula could actually be used to screen for steroid abuse, especially in the athletic and forensic situations in which individuals so often attempt to deny such behavior?⁷ Pope’s formula sounds like it could be a cheap, relatively non-invasive way to test, doesn’t it? Coaches could simply order body composition tests for their athletes and they’d know almost immediately if they had any potential drug users on the team. Just weigh and measure the kids, plug their scores into the automatic calculator now readily available at: www.bodybuilding.com, and you’d know who your drug users are.⁸

While this may sound promising to some, it seems wrong-headed and potentially dangerous to me. And, when I began looking into the FFMI and how Pope had derived the formula, I was struck by the role that history—or should I say “bad history”—had played in its creation. Pope’s lack of understanding of the history of physical culture and sport training has caused him to base the FFMI on historical assumptions that are simply incorrect. I will show today why Pope’s assertion that Steve Reeves’ body

The Fat Free Mass Index for Males (FFMI)

$$\text{FFMI} = \text{LBM} + \frac{6.1 \times (1.8 - H)}{H^2}$$

LBM= Lean Body Mass in Kilos
H = Height in Meters

represents the pinnacle of non-drug-using muscular development is wrong, and I will further show why Pope’s predictions about the kind and amount of muscle one can build without steroids are based on an incorrect understanding of the history of resistance training.

I raise these issues because—as the existence of the Fat Free Mass Index becomes more widely known through the publicity surrounding *Game of Shadows*, and the soaring sales of Pope’s popular book called *The Adonis Complex*—I fear we will begin to see the “false naming” of individuals as steroid users who have never



Psychiatrist Harrison Pope, lead author of *The Adonis Complex*, teaches at Harvard University Medical School, and specializes in research on men’s perceptions of their body image and appearance.

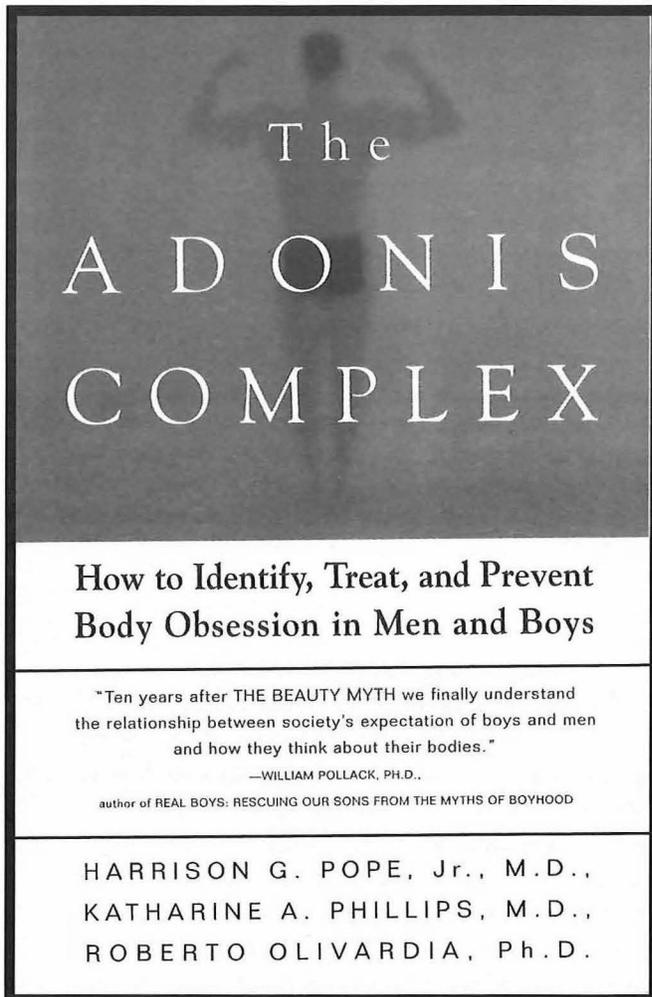
touched an anabolic drug.⁹ In the wrong hands—in the wrong circumstances—what the *New York Times* has dubbed “The Buff Equation” could be used as a new form of profiling that will tarnish the reputations of some athletes and recreational weight trainers who are legitimately drug-free.¹⁰

My other fear is that the existence of such a formula may fuel the desire of some young men and women to *begin* using steroids. Why should anyone pay attention to the old coaching homily about seeing how far you can

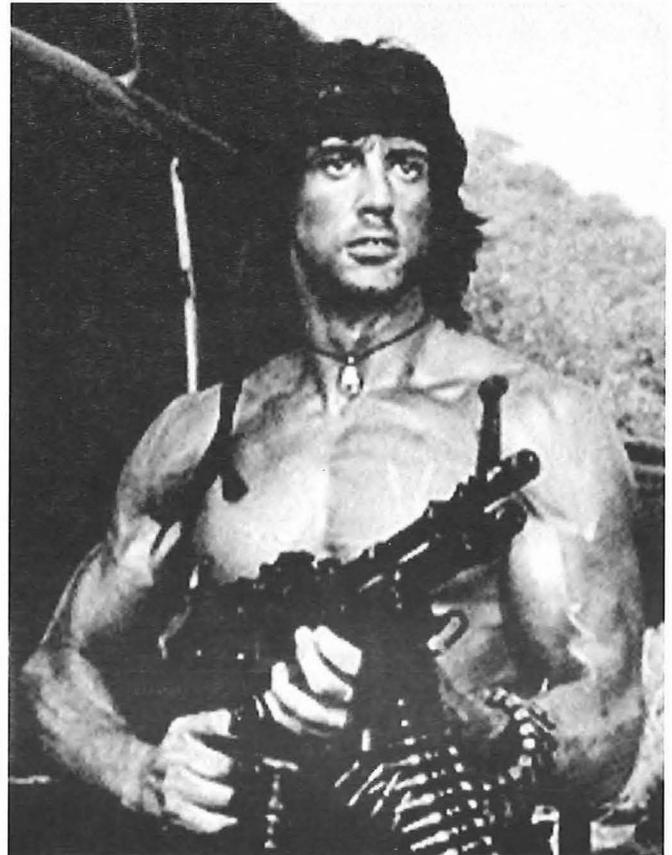
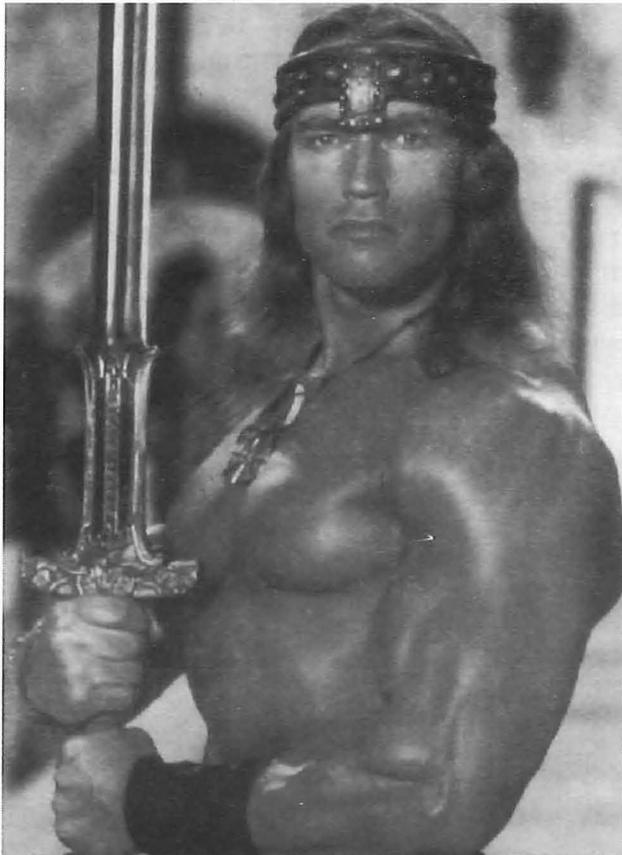
take your body without drugs, when Pope and his colleagues write, “on the basis of our research, we believe that it is impossible to be extremely muscular and lean without chemical assistance.”¹¹ Such a bald statement in a book that’s been reviewed and discussed in nearly every major newspaper in America—and that’s mentioned on thousands of websites—can’t help but suggest

to some that steroids may be their only path to the body they desire.¹² Just remember how Androstendione sales skyrocketed after Mark McGwire admitted he was using it back in 1998. People didn’t turn away.¹³

Please don’t misunderstand my intent here. I’m not suggesting that there are no limits to the amount of muscle an individual can build without steroids. I’m not trying to argue that professional bodybuilding is a clean sport, or that thousands of athletes in a variety of sports aren’t using drugs—and aren’t bigger and stronger because of those drugs. My concern is with Pope’s suggestion that we should be profiling people as potential drug users because of an arbitrary number he mistaken-



Published in 2000, *The Adonis Complex* argues that a growing number of men suffer from “body dysmorphic disorder,” a psychiatric condition that causes them to be so dissatisfied with their physical appearance that they begin having mental problems. Many of them, according to the book’s authors, become obsessive about weight training and begin using anabolic steroids and other drugs.



The year 1982 was pivotal in the history of the male body in American cinema. Arnold Schwarzenegger played the lead in *Conan the Barbarian* that year and the film proved so popular with young moviegoers that Schwarzenegger was quickly hired for a sequel, *Conan the Destroyer* (1984). Sylvester Stallone, already well known to movie audiences for his athletic body in the first two *Rocky* films, stunned moviegoers in 1982 when he appeared as John Rambo in *First Blood* sporting a much more defined and muscular physique than in his previous films.

ly believes represents what he calls “Mother Nature’s Limits.”¹⁴

The Fat Free Mass Index was derived by Pope and several psychiatric colleagues at Harvard’s Medical School as part of their research related to a new psychiatric condition, called at various times in their research articles, “bigorexia,” “reverse anorexia nervosa,” “body dysmorphic disorder,” and, most recently, the “Adonis Complex.”¹⁵ According to Pope, who’s played the leading role in this on-going line of research, men suffering from the Adonis Complex become obsessive about the appearance of their bodies in much the same way that anorexic women avoid eating because they constantly worry about whether they are fat.¹⁶ Although body dysmorphic disorder can cause men to obsess about hair loss and whether certain body parts are out of proportion, most of Pope’s research subjects are young men who want to be larger and more physically imposing and who have a skewed conception of what their own bodies

look like. To correct this, Pope contends, many of them head to the gym where they become obsessed with weight training and the pursuit of greater muscular size. Those in whom the affliction is the strongest, Pope argues, often turn to steroids and other ergogenic drugs such as Human Growth Hormone.¹⁷ They generally do this not to become better athletes but for the sake of their appearance and self-concept. The Adonis Complex, he cavalierly claims—and here I quote—“afflicts millions in our society and around the world,” and it has been brought on by “modern society’s and the media’s powerful and unrealistic messages emphasizing an ever-more muscular, ever more fit, and often unattainable male body ideal.”¹⁸ Perhaps we should rename all gyms—if there are truly millions of such folks—Body Dysmorphic Centers.

To his credit, Pope has demonstrated in several important research studies that boys born after 1970 have been increasingly bombarded with images of mus-

cularity and male nudity that were not common in the early twentieth century.¹⁹ I agree with his contention that images of idealized male bodies may be partly responsible for some young men's obsession with muscularity and appearance. Arnold Schwarzenegger and Sylvester Stallone created an unprecedented interest in the physique in Hollywood; and it's no secret that these days when a leading man takes his shirt off—be it Brad Pitt in *Troy*; or Will Smith in *I am Legend*; or Daniel Craig, the new James Bond; or even Matthew McConaughey—the body on display will be vastly different than those of leading men from the first half of the twentieth century. Take a look, for example, at the painfully thin Humphrey Bogart, the lanky Randolph Scott, and heartthrob James Dean, on page 8. Note that even such action heroes as Tarzan, played by the somewhat fleshy Johnny Weissmuller, just didn't have the big biceps, developed pectorals, or six-pack abdominals we associate with leading men today.

One of Pope's most interesting studies, published in 1999, was an anthropometric analysis he and his colleague, Roberto Olivardia, did of the changes in the body of G.I. Joe dolls and other superhero action figures.²⁰ The researchers measured the waist, chest, and biceps of the dolls and then projected those measurements onto the body of a 5'10" male. If the original G.I. Joe—shown on the left in the picture on page 9—were a

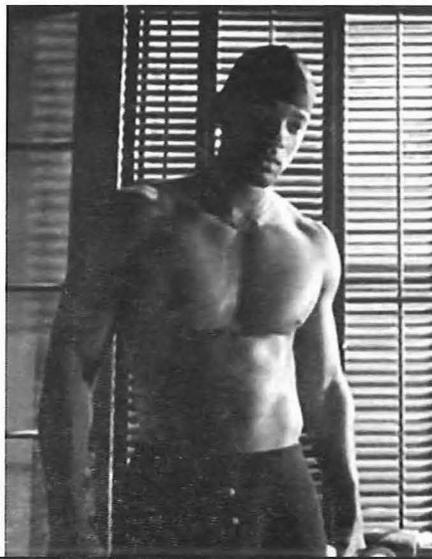


After Brad Pitt agreed to play Achilles in *Troy* (released in 2004), he began a seven-month diet and weight training program that helped him add more than 20 pounds of muscle to his already lean frame.

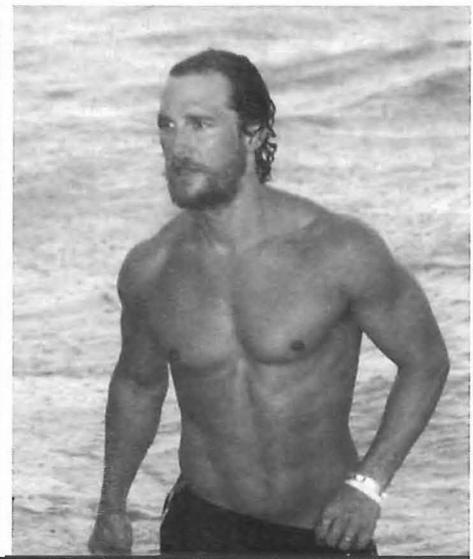
real man standing 5'10" high, Pope and his colleagues claim he'd have a 32" waist, a 44" chest, and he'd measure about 12" around his upper arm. Our modern version, the G.I. Joe Extreme—a product of the post-steroid era—would measure 57" in the chest and have 27" arms



Daniel Craig in *Casino Royale*

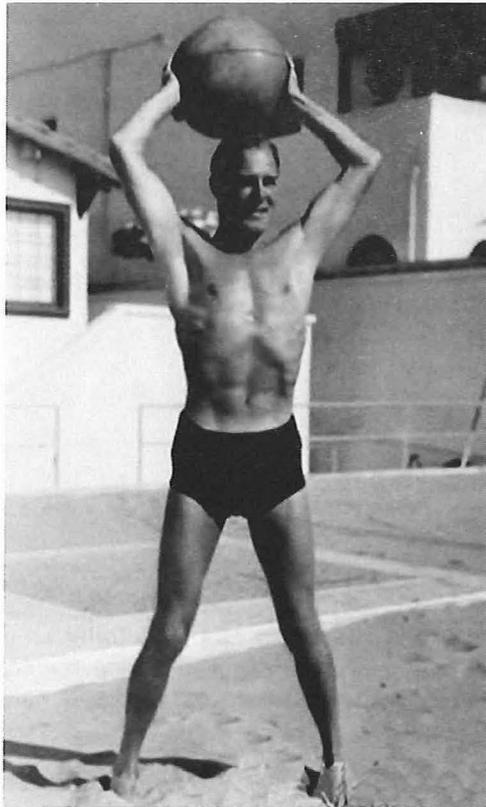


Will Smith in *I Am Legend*



Matthew McConaughey in *Sahara*

Modern film stars such as Daniel Craig, Will Smith and Matthew McConaughey work nearly as hard on their physiques as they do learning their lines for a new film. As can be seen in these photos, the level of muscularity many modern film stars achieve is truly impressive.



Early twentieth-century leading men like Randolph Scott (left) and Humphrey Bogart (above in a photo from 1948) presented the public with a different image of the male body than the post-Arnold-era movie stars of today.

if he were human. G.I. Joe is not alone—modern Batman dolls measured by Pope also had the equivalent of a 30” waist, 57” chest and 27” biceps.²¹

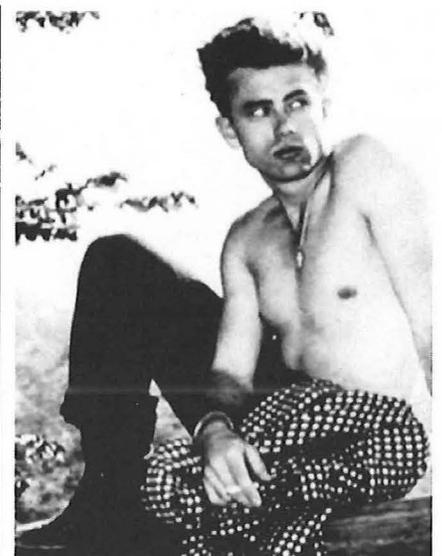
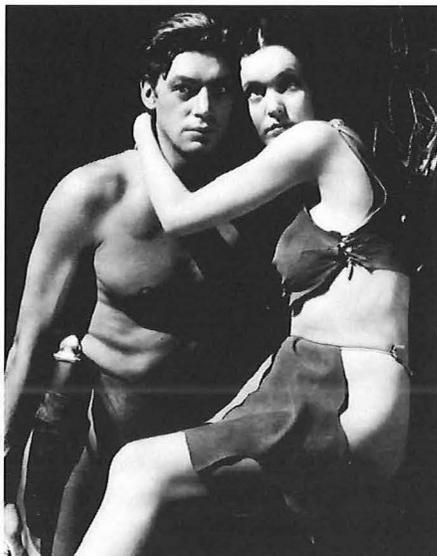
It’s not surprising that children’s toys have changed so dramatically since the comic book figures on which these action figures are based have also gone through what I believe is a steroid-driven metamorphosis. For instance, take a look at the photos of Superman on page 10, showing his transformation from the “normal looking” male body used on the cover of his first comic book in 1938, and then see how Superman’s body changes over time—

The extra flesh around Tarzan star Johnny Weismuller’s waist, and the undeveloped pectorals and slender arms of heartthrob James Dean would be ridiculed by modern audiences who are now used to seeing male film stars who are lean and muscular.

and gets larger and larger—especially after steroids are introduced in the late 1950s. Batman, whose body appears simply athletic in 1939, when his first comic book appeared, goes through a similar metamorphosis into hyper-muscularity as does, as I’m sure most of you are aware, just about every other superhero who appears in comic books, or in TV cartoons, or in the new graphic novels and video games so popular with the young. After all, what child could believe that Superman possessed superhuman strength if he didn’t look at least as muscular as the humans who now inhabit our world—men such as Ronnie Coleman, for example—the

eight-time Mr. Olympia who at a height of 5’11” has competed in bodybuilding contests weighing as much as 296 pounds?²²

Where I think Pope and his colleagues went astray is NOT in their assessment of the changing cul-





In a study in which they looked at the changing dimensions of children's toys, Pope and his colleagues measured the 1964 version of G.I. Joe and then extrapolated the doll's measurements onto the body of a man standing 5'10" high. According to their calculations, the doll on the left above would have a 32" waist, a 44" chest, and upper arms of approximately 12" if he were of human dimensions. In the center, the modern, GI Joe Extreme—a product of the post-steroid era—would measure 57" in the chest and have 27" arms if he were a man standing 5'10" in height. The Batman action figure, on sale in 2007, is another example of Pope's belief that steroids have changed our vision of the ideal male body. Batman action toys measured by Pope, which were similar in dimension to this doll, would have a 30" waist, 57" chest, and 27" biceps, if the doll was made the height of a human male of 5'10".

tural milieu or of how important the appearance of fitness and muscularity is to our notion of an ideal body. Where they went astray is in the way they derived the FFMI itself and in the images they've chosen to use as evidence of what males can achieve who train with weights and don't use drugs. In the article in *The Clinical Journal of Sports Medicine*, Pope and his colleagues explain that they used two sets of subjects to create the formula. The first group consisted of 157 young men whom they found by soliciting for volunteers in gyms in Boston and Los Angeles. Their second set of "subjects" was a series of photographs of the Mr. Americas from 1939-1959 and the various muscle magazine reports that contained the measurements of the winners. These men were chosen, Pope explained, because they competed before steroids were used by athletes and bodybuilders.²³

The gym members—the living subjects that

Pope and his colleagues actually weighed and measured—had agreed to participate in a larger psychological assessment about their perceptions of their body. Pope and his colleagues did skin-fold caliper measures on 83 steroid "users" and 74 "nonusers."²⁴ The length of time these subjects had trained was not noted, although Pope and his team reported that the non-users included "many dedicated bodybuilders," but then did not define what they meant by their use of that term. This is an important distinction since "bodybuilder" is frequently used to describe recreational weight trainers rather than competitors in physique contests. "Several" of them, Pope and his research team wrote, had competed "successfully" in natural bodybuilding contests, although they did not define how they measured "success" or—just as important these days—which federation was sanctioning the contest. This matters because there are multiple fed-

The Evolution of Superman



1938



1955



1965

Volume 1, Number 1 of the Superman comics appeared in 1938. Over the next seventy years Superman's body would — like the bodies of modern bodybuilders — grow larger and larger while also becoming increasingly defined and vascular as the steroid era moved into full swing.



1974



1985



1995

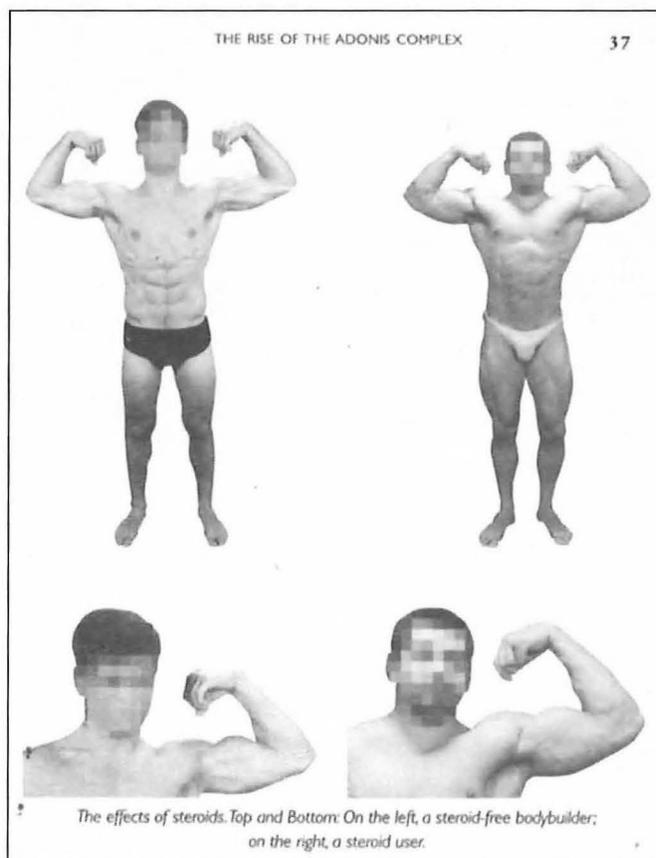


Ronnie Coleman, the eight-time winner of the Mr. Olympia title, weighed 296 pounds when he won the Mr. Olympia contest in 2004.

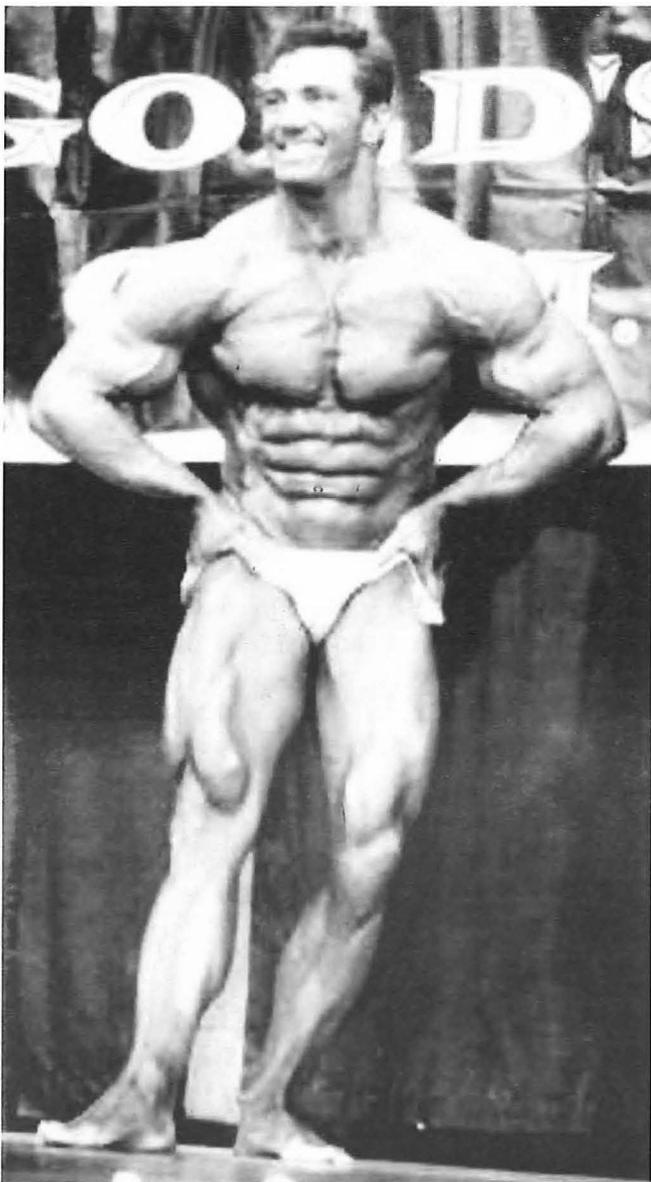
erations in bodybuilding, and these different associations hold contests in a variety of divisions, and with different drug testing protocols. Two of the subjects, Pope claimed, held “world records” in strength events—although, again, he and his colleagues do not provide details about this. If the records were set in powerlifting, the concept of being a world record holder may be virtually meaningless since at last count there were more than ten different world powerlifting federations—with ten different sets of world records.²⁵ (In fact, powerlifting is now so fragmented that there are more than 15 American federations.) And finally, they wrote, “many others were recognized by their associates as highly successful weightlifters,” although technically a weightlifter is an athlete who performs snatches and clean and jerks—lifts in which the barbell ends up overhead. These lifts are not commonly done in commercial gyms. Pope meant, I’m sure, “weight trainers”. . . or maybe “bodybuilders.”

This lack of accurate use of the vocabulary of lifting is frustrating, to say the least. In any case, Pope and his colleagues conclude the description of their human subjects by stating, “Thus, the nonuser group probably included individuals who closely approached the maximum limits of muscularity that could be attained without drugs.”²⁶

While Pope and his colleagues may believe that his volunteers “approached the maximum limits of muscularity that could be attained without drugs,” I certainly wasn’t convinced that they’d found the “maximum limits of drug-free muscularity” when I saw the photo that Pope and his colleagues included in *The Adonis Complex* as an example of what’s possible for a steroid free “bodybuilder.”²⁷ While the young man on the left below is certainly lean—calling him a “bodybuilder” is a bit misleading. Even taking into consideration that the photographer may have shot him from an overhead angle that skewed the image, his body does not begin to



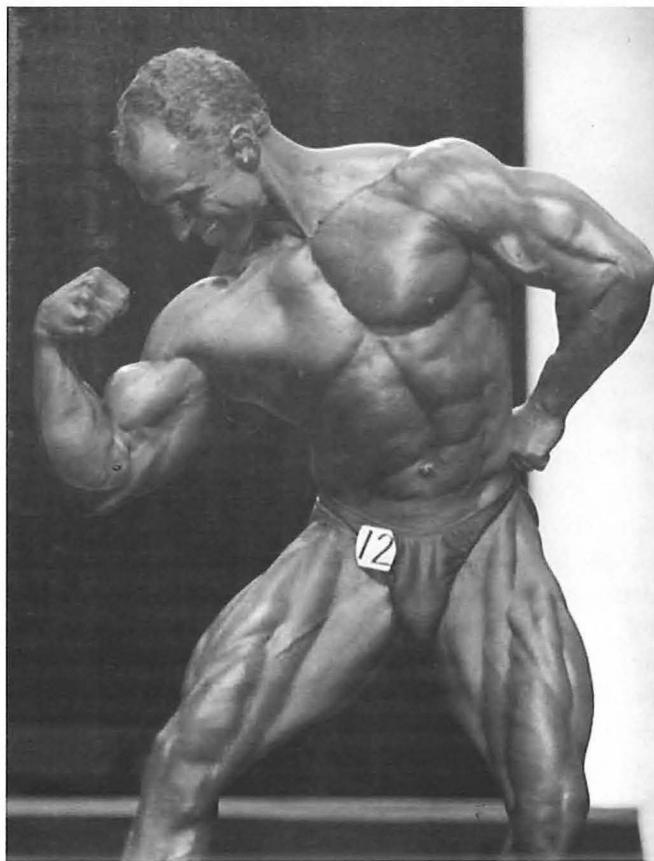
In this picture from page 37 of *The Adonis Complex*, the young man on the left is described as a “steroid-free bodybuilder,” whose physique should be considered as an example of the upper limit of muscularity possible without taking drugs. The man on the right is identified as a steroid user.



John Hansen, who's held both the Natural Mr. Universe and Natural Mr. Olympia titles, has trained for more than 20 years and possesses a body that carries far more muscle than the young man chosen by Pope as an example of the maximum muscularity possible without the use of drugs.

approximate what I know to be possible with proper training. This young man, who Pope tells us is only 20 years old, shows no signs of any serious leg training, and he has none of the fullness and thickness of muscle that years of training can produce—even without drugs. As a counterpoint, here is a photo of John Hansen, who has held the Mr. Natural Universe and Mr. Natural Olympia titles and who's undergone drug testing many times. I've met John only once and so I certainly can't testify to the veracity of his claim to being drug free—although I've read his book *Natural Bodybuilding* and I have no

particular reason to doubt his assertion.²⁸ As you can see, John bears little resemblance to Pope's so-called "bodybuilder." Another example of what's possible without drugs can be seen in this picture of my long-time friend Dave Goodin. Dave took a masters degree in exercise physiology at the University of Texas back in the early 1980s just as he was getting involved in bodybuilding. Dave and I officed on the same hallway during his years at UT, and after graduation he opened a gym just north of the campus where I sometimes train. For twenty-five years he's competed only in drug-free bodybuilding contests (and occasionally a drug-free powerlifting contest), and he keeps his body fat under 5% year-round. Dave now promotes bodybuilding shows in Texas but sponsors only drug-free events, and so, as much as you can know about anyone, I feel pretty comfortable stating that Dave's body is truly the work of his lucky genetics, his close attention to the latest developments in nutrition, and his many years of regular, heavy training.²⁹ Still actively competing at age 49, he



Dave Goodin, at age 49, is still actively competing in drug-free bodybuilding contests. During his long career, he's won nine international titles in drug-free bodybuilding and has been a three-time winner of the World Natural Bodybuilding Championships.

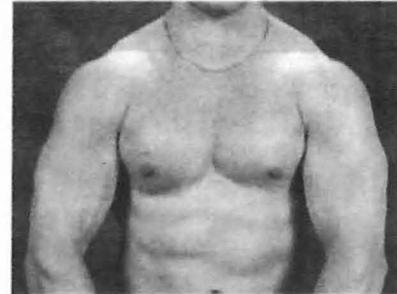
uses exercises, routines, and weights that, I'd bet, the vast majority of Harrison Pope's subjects were not using in their training. Bodybuilding training, as opposed to the kind of workouts regular citizens do who simply want to maintain fitness, generally requires many more sets, the use of more difficult multi-joint exercises, and heavier weights than most people care to attempt. To think that Pope found 157 serious bodybuilders who train at all like Dave or John do week in and week out stretches my imagination.

While these images of Dave Goodin and John Hansen are fresh in your minds, I wanted to show you another page from *The Adonis Complex*. Pope and his colleagues included these pictures to alert readers to the fact that anabolic steroids stimulate muscle growth in the upper body, particularly in the shoulder

area. According to Pope, all three of these men "display a disproportionate amount of muscularity in the shoulders and upper arms," and he argues that the existence of such muscle mass is a "subtle example" of steroid use that an "untrained observer might not recognize."³⁰ I've been lifting weights since 1973, and my husband, Terry, who's known to most of you, was a national champion in lifting and has lifted weights now for more than fifty years. We attend the Arnold Sports Festival each year and know nearly everyone in the world of weights from Lou Ferrigno to Arnold Schwarzenegger to Joe Weider himself, and we've furthermore been involved in the drug-free lifting movement for nearly three decades. Neither of us—or the several bodybuilding friends to whom I showed these pictures—saw any definite evidence of steroid use in these photos. To us, these look more like athletic young men who have been doing heavy benches and heavy lat and deltoid work. It may certainly be that they've used steroids and that this use

38

THE ADONIS COMPLEX



This set of illustrations on page 38 of *The Adonis Complex* is captioned: "Clues that Your Son or Boyfriend May be Taking Steroids." According to Pope, all three of these men "display a disproportionate amount of muscularity in the shoulders and upper arms," and he argues that the existence of such muscle mass is a "subtle example" of steroid use that an "untrained observer might not recognize."

has allowed them to attain their current development more quickly, but it is my opinion that what they've created is well within the normal "steroid-free" range. My guess is that there are any number of football players at Penn State, or Ohio State, or at any other big Division I program like the University of Texas—who have been training with weights since their early teens—young men who would have as much or more muscular development in their upper bodies as these men, and that they had built that muscle without touching a prohibited substance. These three upper body shots do not suggest to me that any of them have violated what Harrison Pope calls "Mother Nature's longstanding limits," and it concerns me when he baldly states, "by comparing the pictures, you may learn to recognize possible steroid use even in men with an FFMI of less than 25."³¹ To me, this is clearly an example of profiling, and I think it's potentially dangerous.

Let's turn now to Pope's decision to use the Mr.

Americas for his second group of “subjects.” To calculate the FFMI ratings of these pre-steroid men, he and his colleagues used the published heights and weights in various muscle magazines, and then Pope personally made a determination of body fat by studying muscle magazine photos taken around the time they won the Mr. America contest. He then made a subjective judgment about the men’s body composition.³² Pope was only able to find photos for 18 of the 20 Mr. Americas in this period, and in the article published in *The Clinical Journal of Sports Medicine* a chart is included showing each man’s FFMI score.³³ (You’ll note below the arrow I’ve placed beside Steve Reeves’ name and the fact that on this chart his FFMI is listed at 23. In Pope’s book, *The Adonis Complex*, Reeves is listed with a FFMI of 25.7, yet Pope never explains the discrepancy.) I was surprised to find when I read the article in *The Clinical*

Journal of Sports Medicine that the heights, weights and body fat numbers assigned to the Mr. Americas were not also listed in this peer-reviewed article; only the chart with the final FFMI appears. So, I contacted Dr. Pope to ask if he still had a record of the body fat estimates he’d used when he’d rated the Mr. Americas, and in an email response he told me he’d never published the specific body fat estimates and that “it would be tough to find them now, because I did them back in 1994.” He added, however, that he remembered “that the estimates ranged from about 6% to a maximum of about 16%.”³⁴ The 16% figure completely floored me because no one—even in the early days of the sport—would have won the Mr. America contest with a body fat reading in that range, and so I decided to do my own calculations.

Since I also had access to the heights and weights of these men at the time that they won the Mr.

America contest, I asked my UT colleague, Dr. Marlene Dixon, to help me set up the formula, and I asked Terry to assist with the process of estimating body fat. Please understand that Terry and I—just like Pope—used our subjective judgment to estimate the body fat percentage of these men. However, we feel comfortable that we’re at least as qualified to make such judgments as Pope was since we have also done body composition testing on several hundred subjects in various research projects over the years, and because Terry and I keep up pretty closely with the world of bodybuilding by subscribing to dozens of bodybuilding magazines and because we attend the various shows. In any case, when I ran our numbers through Pope’s formula, we got a somewhat different set of results. We included all 22 men in our estimate—and the *average* FFMI for the 22 men known as Mr. America in the pre-steroid era according to *our* calculations was 26.44. Fifteen men out of that 22—nearly 70%—had FFMI’s above 26, which on Pope’s scale would mean that they should be considered potential steroid

TABLE 2. Estimated normalized FFMI's of Mr. America Winners, 1939–1959

Year	Name	Normal FFMI
1939	Goodrich	24.3
1939	Essmaker	22.6
1940	Grimek	24.0
1941	Grimek	26.9
1942	Leeight	25.5
1943	Bacon	23.9
1944	Stanko	27.3
1945	Ross	26.1
1946	Stephan	25.9
1947	Reeves	23.0 ←
1948	Eiferman	27.7
1949	Delinger	28.0
1950	Farbotnik	26.5
1951	Hilligenn	26.0
1952	Park	NA
1953	Pearl	25.8
1954	Dubois	25.4
1955	Klisanin	23.5
1956	Schaeffer	NA
1957	Lacy	25.2
1958	Sansone	26.8
1959	Johnson	24.6
Mean ± SD		25.4 ± 1.5

Clin J Sport Med, Vol. 5, No. 4, 1995

users. I should clarify that in the 1995 article in *The Clinical Journal of Sports Medicine* Pope uses the lower figure of 25 as the line of demarcation beyond which someone should be suspected of being a steroid user. If we use this original number, eighteen of the pre-steroid era Mr. Americas would be considered suspect—that's 82%. If we omit the two men Pope didn't include because he couldn't find photographs, our average for the remaining 20 Mr. Americas is 26.54, a number that's just slightly higher than the average for the entire group.

One of the most interesting aspects of all this is why Pope didn't pick the two-time Mr. America John Grimek as his example of the maximum muscular development possible without steroids. Grimek was more admired as a bodybuilder than was Reeves, whose competitive career was actually relatively short-lived because he moved to Europe and became famous for playing Hercules in a series of sword and sandal film epics. Within the bodybuilding community, and I believe John Fair will agree with me on this, Grimek's was the iconic body—not the taller and more slender Reeves.³⁵ Grimek had been competing in weightlifting for more than ten years when he decided to enter the first official AAU Mr. America contest in 1940. Because he also competed in the weightlifting contest that same evening, Grimek was down in weight, weighing only 193 pounds. The next year, however, he didn't lift and entered only the Mr. America contest. That night he weighed 221 pounds, yet

he was just as lean and far more muscular than the year before. Grimek so dominated the competition in 1941 that the officials decided to pass a rule that from that time forward a man could only win the Mr. America title once. At 5'8" and 221 pounds we estimated Grimek's FFMI at 31.99, a score that's well above Pope's cut-off point. So, why isn't that the number above which we should be concerned?

Year	Mr. America	Height (M)	Weight (K)	Body Fat (%)	Normalized FFMI
1939	Bert Goodrich	1.79	88.5	0.11	24.64356609
1939	Roland Essmaker	1.8	82	0.1	22.77777778
1940	John Grimek	1.73	87.5	0.07	27.61634812
1941	John Grimek	1.73	100.5	0.07	31.99170313
1942	Frank Leight	1.8	94.8	0.09	26.62592593
1943	Jules Bacon	1.7	76.2	0.07	25.13110727
1944	Steve Stanko	1.82	101.25	0.09	27.69393407
1945	Clancy Ross	1.75	87.09	0.09	26.18317143
1946	Alan Stephan	1.8	93	0.09	26.12037037
1947	Steve Reeves	1.85	87	0.08	23.08141344
1948	George Eiferman	1.7	88	0.09	28.31934256
1949	Jack Delinger	1.68	88	0.09	29.10501587
1950	John Farbotnik	1.75	88	0.1	26.16622449
1951	Roy Hilligenn	1.68	81	0.07	27.42205102
1952	Jim Park	1.77	84	0.08	24.85024121
1953	Bill Pearl	1.77	91.17	0.08	26.95576645
1954	Dick Dubois	1.85	98	0.08	26.03831629
1955	Steve Klisanin	1.77	83.9	0.09	24.55307246
1956	Ray Schaeffer	1.78	95.25	0.08	27.77949274
1957	Ron Lacy	1.73	84	0.09	26.06744572
1958	Tom Sansone	1.8	96.25	0.08	27.33024691
1959	Harry Johnson	1.75	84.5	0.09	25.41357143
				Average	26.44391385

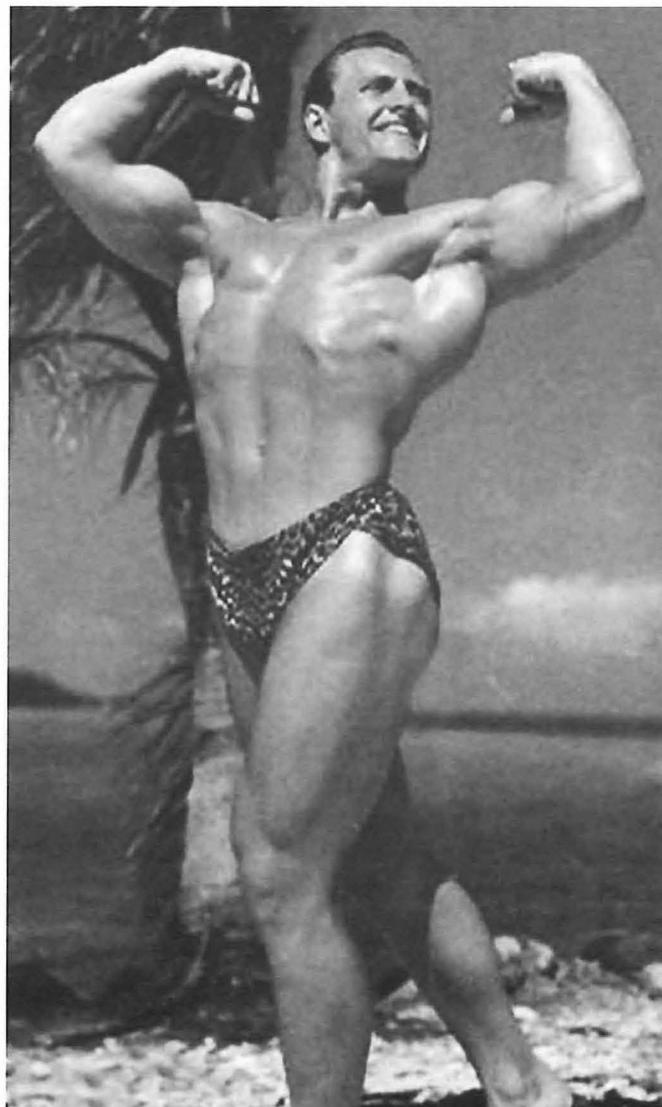


In 1941, when this photo was taken, the 32-year-old Grimek had packed 221 pounds of muscle onto his 5'8" frame. By our calculations, that gives Grimek an FFMI rating of 31.99, making him a much more realistic standard for a person's ability to build muscle without the use of steroids.

What Pope apparently didn't understand when he decided to use the Mr. Americas was that bodybuilding was in its very early stages in the United States when the first Mr. America-type contests were held in 1939. Almost no one trained specifically for physique before World War II, since bodybuilding contests—when they

were held at all—were generally held after weightlifting meets, almost as an afterthought. Many times the men who competed in these early shows just stripped down after they finished lifting and had their physiques judged.³⁶ Because it wasn't considered as important as the weightlifting that preceded it, most early bodybuilders did not cut back as dramatically on their food as modern bodybuilders do before a contest, and they primarily focused their training on the needs of weightlifting—not bodybuilding. In fact, when you look at photos of some of these early Mr. Americas, one of the first things people notice is how small and relatively flat the pectoral muscles were on these early champions. The reason for this is because the bench press was not nearly as important an exercise then since it played no role in competitive weightlifting. Nor did many of them use lat machines or leg curl or leg extension machines, or even incline benches because these pieces of equipment were somewhat rare until the 1950s. Furthermore, the idea of organizing your training into some sort of program and varying the volume and intensity of the workouts was poorly understood. Also rare until well into the 1950s were such standard bodybuilding training methods as the set system, supersets, cheating principles, and many of the other systems and principles we now know help produce greater muscle mass when included in an organized routine.³⁷ Given their limited equipment and primitive theoretical understanding of how resistance training works most effectively, these early pioneers built what muscle they could. However, to suggest that their bodies should be regarded as an ideal or as a "steroid-free maximum" in our era—now that health clubs are filled with equipment that can isolate nearly every skeletal muscle in our body, now that we understand how periodization theory works, and now that nutrition is central to the Iron Game—is at best misleading, and possibly even disingenuous.

Before moving on, I'd like to make one other point. After the "Grimek Rule" was passed and men were not permitted to win the Mr. America title more than once, the amateur Mr. America contest became for most men either the end of the competitive road or an early stepping stone on the way to a pro career—not that there was all that much pro bodybuilding then. Because of the Grimek Rule many of the early winners were young men—whose bodies had not had time to fully mature. Steve Reeves, for example, was only 21 when he won the Mr. America title, and he weighed just 192 pounds. He was more than 20 pounds heavier when he won the professional Mr. Universe title several years lat-



Bert Goodrich, winner of the 1939 Mr. America contest, and Alan Stephan, Mr. America of 1946, had excellent physiques for their day. Note, however, how the pectoral muscles of both men, and John Grimek on the previous page, are not nearly as thick and well-developed as those of modern bodybuilders. The primary reason for this is that heavy bench presses were not a regular part of most bodybuilders' training routines in the 1940s.

er, and at that weight his FFMI would have been well over 26. At the top of page 18 you can see a great illustration of the benefits of training over time. On the left is Bill Pearl at age 23 in a photo taken at the time he won the Mr. America contest in 1953. Three years later, in 1956, his muscles are much larger and he's physically more mature. Why should the early score be used by Pope as the standard—when Pearl's transformation in the pre-Dianabol years of the 1950s clearly demonstrates that with more years of training greater muscle size is possible?

If Pope had had a better understanding of the history of lifting, there *were* men he could have used to help him find a more accurate measure of how much

muscle mass is possible without using anabolic drugs. Had he only looked to the wrestlers and professional strongmen who graced the circuses and variety theaters of North America and Europe at the turn of the twentieth century, he would have had a much more physically impressive group of athletes to compare to his 157 subjects. There isn't time today to show you all the men I think are more likely candidates to be considered the "most muscular men" of the pre-steroid era, but just for a moment let's consider the nine men shown on pages 19 and 20—all of whom had concluded their careers before the steroid era dawned in 1958. The average FFMI for these nine early pioneers (according to our calculations) is 29.06, well above Pope's numbers of 25 and 26. It is



These two pictures of Bill Pearl provide graphic evidence of the difference a few years of training in the pre-steroid era could make in the development of a man's physique. In the photo on the left, taken in 1953, Bill Pearl weighed 193 pounds at 5' 9.5", which would give him a FFMI score of 26.95 according to our calculations. The photo on the right was taken in 1956 prior to an exhibition in the Hawaiian Islands. He weighed 222 at this time, which would give him a FFMI reading of 29.8.

also worth noting that Sandow and Barry Bonds have almost exactly the same FFMI, yet Sandow died in 1925.

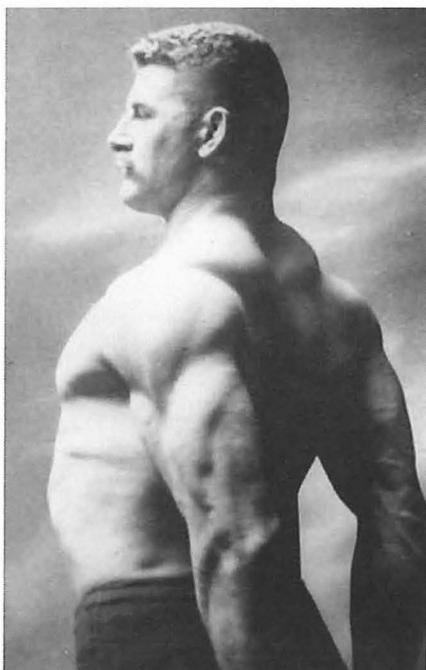
Some of you may wonder why we should both-er with all this . . . am I, perhaps, just nit-picking? I don't think so . . . I think we've come into a new era for sport—and we need to consider whether this is also a new era for sport history. There was a time when sport was sport, and resistance training and other methods of physical culture occupied only the fringes of sport prac-tice—and the fringes of our academic discipline. Our colleague Jack Berryman told me once that in 1986, when I won the NASSH graduate student award for my essay on Bernarr Macfadden, that the committee had debated for some time on whether a paper dealing with

issues of body culture and exercise should be allowed in contention for the sport history prize.³⁸ I'm very glad that it was allowed . . . as the winning of that prize intro-duced me to this warm and generous community of scholars whom I consider my primary academic family. However, 22 years later, I continue to believe that we must study physical culture as well as sport. As sport historians we must pay attention to training, to nutrition, and to innovations in technology and sport medicine that are dramatically altering the landscape—and the bod-ies—of modern sport.

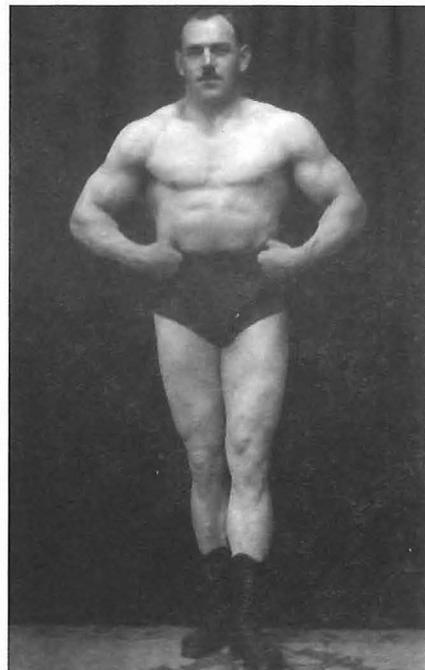
What saddens me most about the whole Pope/FFMI affair is that until now no one has raised questions about the historical basis of his theory—even



Louis Uni, "Apollon", 6' 2.25",
260 lbs., FFMI 30.4



Gustav Fristensky, 6',
230 lbs., FFMI 28.1



Hermann Goerner, 6',
260 lbs., FFMI 31.2

Pre-Steroid Era Strongmen Who Should Be Suspected of Drug Use According to Pope's Fat Free Mass Index

John Lemm, 5'8",
216 lbs., FFMI 28.9



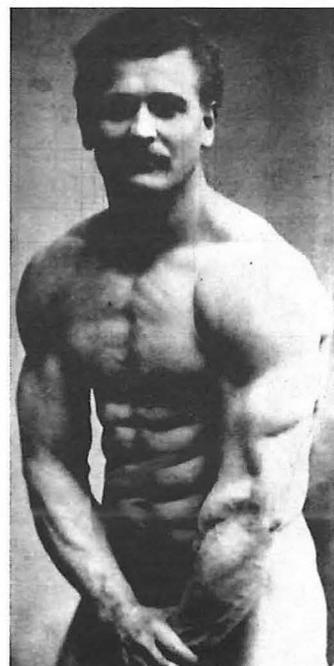
George Hackenschmidt
5'9", 220 lbs., FFMI 29.5

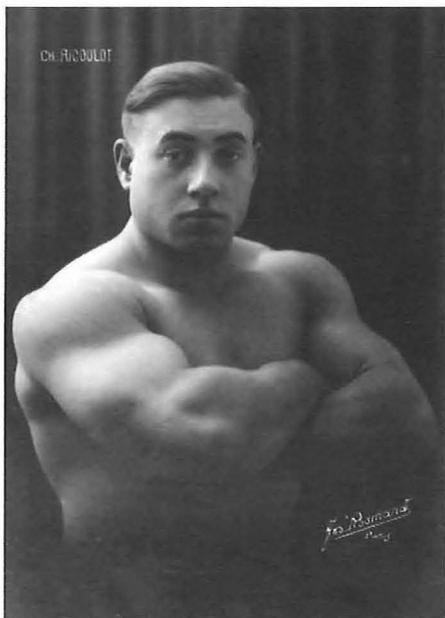


Bobby Pandour, 5'6",
175 lbs., FFMI 27.6

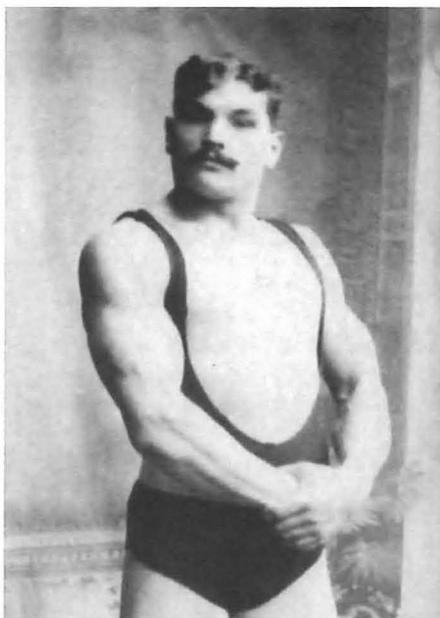


Eugen Sandow, 5'8",
206 lbs., FFMI 28.3





Charles Rigoulot, 5'8",
230 lbs., FFMI 30.1



Arthur Saxon, 5'9.5",
210 lbs., FFMI 27.5

though that first paper was written thirteen years ago. Even some of the bodybuilding writers—who should definitely know more about what is humanly possible are now citing Pope's formula.³⁹ This scares me. We have enough problems in the world of sport without profiling and falsely identifying people as steroid users who have never used drugs.

So what about Barry Bonds—what should we believe? Well—there's no question that Bonds has become much heavier and far more muscular since he's been training with weights. But when I look at the transformation he made and then consider Bill Pearl, or other individuals I know, who have also transformed themselves through heavy training (and without drugs), I'm not convinced simply by the visual evidence that Bonds is a user of performance-enhancing drugs. In my opinion, his physical development barely *suggests*; it certainly doesn't *prove*. After looking at the bodies of the early twentieth century strongmen which I showed on pages 19 and 20, I'd have to say that Bonds' 28 on the FFMI (which may itself be an exaggeration since the body fat percentage came from Greg Andrews) means nothing.

From my vantage point, Pope and his colleagues have either ignored the fact—or been unaware—that there is a great training revolution going on in the United States. To their credit, Fainaru-Wada and Williams don't base their indictment of Bonds *only* on Pope's for-

mula. However, coaches, principals, parents, and others are encouraged by Pope in *The Adonis Complex* to use this formula as a diagnostic and a forensic tool. Without a better understanding of what is possible with weight training alone, the prospect of misdiagnosis and its attendant damage to reputations and relationships is both likely and alarming. Granted, there are now approximately 350 NFL players weighing over 300 pounds, and granted that we now see more home runs hit than we did in Babe Ruth's or even Roger Maris' era.⁴⁰ However, weight training for football now begins in junior high school, if not before, and baseball players who used to fear that weight training would lessen their flexibility

and make them muscle-bound are now weighing well over 200 pounds, hiring personal trainers, and bragging about their bench presses. While anabolic drugs are a contributing factor to the larger size and greater power of *some* athletes, historians must help the public understand that we are in the midst of a paradigm shift in the training of athletes. We have entered an era in which, for the first time in history, athletes are employing scientifically-organized strength training throughout their entire sporting careers. Many of today's star players began training as children and have continued to train year-round. A better understanding of this shift could be useful to those trying to keep young men away from steroids. Such an understanding would certainly be better than a formula which, in the wrong hands, could ruin the life of someone labeled as a steroid user who had never touched a performance-enhancing drug.

As a powerlifter back in the 1970s I made a decision not to use anabolic steroids, and I never wavered from that decision. However, because there was no testing in powerlifting in the late seventies, many people assumed when I began setting records in women's powerlifting that I *had* to be a steroid user. That assumption was incorrect. However, even though I knew I'd never used steroids, and my family and friends knew I wasn't a user, it still hurt to have people suggest otherwise. Over the past several decades, as drug use has become increasingly ubiquitous, I've watched this same brand of cynicism spread throughout the world of

sports. It's impossible any more for most Americans to watch the Olympics, or an event like the Tour de France, or an NFL Football game, or a Major League Baseball game, and not have at least one moment when they wonder about the drug status of the people participating in the sport. I'm not saying that this happens in all parts of the world, but the sporting public's heightened awareness regarding drug matters makes us especially sensitized to doping issues and increasingly unwilling to believe that there are still record-setting athletes who make the correct ethical choices. As historians we owe it to the future—as well as to the past—to begin paying greater attention to this new sporting paradigm.

Notes:

The author would like to thank Dr. Terry Todd, Dr. Thomas M. Hunt, and Dr. Marlene Dixon, all of the University of Texas, for their assistance and comments on this lecture.

1. Mark Fainaru-Wada and Lance Williams, *Game of Shadows: Barry Bonds, Balco, and the Steroids Scandal that Rocked Professional Sports* (New York: Gotham Books, 2006), 274-275; Elena M. Kouri, Harrison G. Pope, David L. Katz, and Paul Oliva, "Fat-Free Mass Index in Users and Nonusers of Anabolic-Androgenic Steroids," *The Clinical Journal of Sports Medicine* 5(4) (1995): 223-228.
2. Fainaru-Wada and Williams, *Game of Shadows*, 275. See also: Kouri, Pope, Katz and Oliva, "Fat Free Mass Index," 225. Interestingly, in this 1993 article, Steve Reeves' normalized FFMI is listed at 23 in the chart on page 226 of the article. There is no discussion of when and how that number became a 25.7 as it is listed in: Harrison G. Pope, Katherine A. Phillips and Roberto Olivardia, *The Adonis Complex: How to Identify, Treat and Prevent Body Obsession in Men and Boys* (New York: Touchstone/Simon and Schuster, 2000), 38.
3. Pope, Phillips and Olivardia, *Adonis Complex*, 35.
4. Fainaru-Wada and Williams, *Game of Shadows*, 275.
5. See for example, Mark Fainaru-Wada and Lance Williams, "The Documentation: The Authors' Extensive Research Produced Compelling Evidence of Bonds' Use of Performance Enhancers," *Sports Illustrated* viewed at: <http://sportsillustrated.cnn.com/2006/magazine/03/06/growth.doc0313/> on 14 May 2008. See also: "Bonds Testified that Substances Didn't Work," *ESPN.com*, 4 December 2004, at: <http://sports.espn.go.com/mlb/news/story?id=1937594> on 14 May 2008. See also: "Barry Bonds Steroids Timeline," *ESPN.com*, 7 December 2007, viewed at: <http://sports.espn.go.com/mlb/news/story?id=3113127> on 14 May 2008; and John Kuenster, "Barry Bonds Owns a Tarnished Crown," *Baseball Digest*, 66(8) (November 2007): 51.
6. For examples of the FFMI being discussed by various media see: Brian Walton, "Men's Fitness Expert Lou Schuler Weighs in on Bodybuilding and Steroids and Their Implications," *Scout.com*, 18 February 2005, viewed at: <http://stlcardinals.scout.com/2/353285.html> on 31 March 2008; David Handelsman, M.D., "Book Review: *The Adonis Complex*, The Secret Crisis of Male Body Obsession," *New England Journal of Medicine* 344(2) (11 January 2001): 146-147; Stephen S. Hall, "The Troubled Life of Boys: The Bully in the Mirror," *New York Times*, 22 August 1999, at <http://query.nytimes.com/gst/fullpage.html?res=9A02E2D91E39F931A1575BC0A96F958260> viewed on 28 March 2008; and Filiault, Shaun M. "Measuring up in the Bedroom: Muscle, Thinness, and Men's Sex Lives," *International Journal of Men's Health*, 22 June 2007, viewed at: <http://www.highbeam.com/doc/1G1-168548208.html> on 12 May 2008.
7. Kouri, Pope, Katz and Oliva, "Fat-Free Mass Index," 223. Later in the article Kouri et. al. write: "Because steroids are controlled substances in the United States and may sometimes induce violent criminal behavior, it is increasingly important in certain circumstances to identify and expose individuals who deny their steroid use. Admittedly, one cannot definitively diagnose steroid use simply on the basis of the FFMI, much as one cannot make a definitive diagnosis of alcohol intoxication in a man displaying ataxia and dysarthria upon getting out of his automobile. In the latter case, however, the individual may be required for forensic reasons to produce a breath or urine sample. Perhaps we could ultimately follow an analogous procedure in forensic situations with individuals displaying an abnormally elevated FFMI" (pp. 227-228).
8. The automatic FFMI calculator can be found at: <http://www.bodybuilding.com/fun/likeness10.html>, viewed on 4 April 2008. It is included in an article by Jeremy Likeness entitled "Ten Fat Mistakes." One of the problems with this idea is that it is not unlike using lie detectors to test for drug use, an idea that was tried, and rejected, by several sports federations in the 1980s and early 1990s.
9. See for example: Peter H. McCusker, *From Dweeb to Adonis: The Complete Guide to Manly Excellence* (Bloomington, IN: First Books Library, 2003); Arnold Andersen, Leigh Cohn, and Tom Holbrook, *Making Weight: Healing Men's Conflicts with Food, Weight and Shape* (Carlsbad, CA: Gurze Books, 2000); and James Claiborn, *The BDD Workbook: Overcome Body Dysmorphic Disorder and End Body Image Obsessions* (Oakland, CA: New Harbinger Publications, 2002).
10. Hall, "The Troubled Life of Boys."
11. Kouri, Pope, Katz and Oliva, "Fat-Free Mass Index," 223.
12. One measure of the impact of Pope's book is its "Google Number," or the number of "links" to other web pages on the Internet that show up when "Adonis Complex" is entered as a search term. On 14 May 2008, a Google search for the term "Adonis Complex" turned up 68,500 references. Evidence that these ideas are beginning to circulate within the bodybuilding community can be found in the interview done with Lou Schuler, the fitness author and former editor for both *Men's Fitness* and *Men's Health* magazines. In an interview with Brian Walton, Schuler was asked how someone could identify a steroid user, "That's a very good question," he responded. "And there's actually an answer. A Harvard psychiatrist named Harrison Pope worked out a formula called the 'fat-free mass index,' or FFMI. He measured hundreds of bodybuilders, both natural and juicers, and figured out exactly how much muscle someone could build without adding fat. Beyond a certain point, you can't add more mass

- without also gaining fat ... Humans can build practically unlimited bulk without steroids, but most people would be surprised how little they can build without also being fat. Dr. Pope says that a bodybuilder from the 1940s, Steve Reeves, pretty much hit the ceiling. Steve Reeves was a big guy—6'1", 213 pounds, with 17 ½" arms, but only a 31" waist. And that was the best physique ever built without steroids, according to Dr. Pope. But virtually every bodybuilder and pro wrestler today surpasses that, by a long shot. Lots of other pro athletes do, too." Interview dated 18 February 2005. Viewed at: <http://stlcardinals.scout.com/2/353285.html>. See also: Jeremy Likeness, "Ten Fat Mistakes," viewed at: <http://www.bodybuilding.com/fun/likeness10.html>, on 4 April 2008.
13. "Feds Crack Down on Andro Sales," *AP/CBS News*, at <http://www.cbsnews.com/stories/2004/03/11/health/main605300.shtml>, viewed on 4 April 2008.
14. Pope, *Adonis Complex*, 38.
15. Harrison G. Pope, David L. Katz, and J.I. Hudson, "Anorexia Nervosa and 'Reverse Anorexia' Among 108 Male Bodybuilders," *Comparative Psychiatry*, 34(1993): 406-409; Harrison G. Pope, Amanda Gruber, Precilla Choi, Roberto Olivardia and Katherine A. Phillips, "Muscle Dysmorphia: An Underrecognized Form of Body Dysmorphic Disorder," *Psychomatics* 38(1997): 548-557; Pope, *Adonis Complex*, 37-38.
16. Pope, Phillips and Olivardia, *Adonis Complex*, xiii.
17. Pope discusses the connection between muscle dysmorphia and anabolic steroid use in a number of publications. The best overview is in "Chapter Five: Anabolic Steroids, Dangerous Fuel for the Adonis Complex," *Adonis Complex*, 102-126. See also: Harrison Pope and David L Katz, "Psychiatric and Medical Effects of Anabolic-Androgenic Steroids: A Controlled Study of 160 Athletes," *Archives of General Psychiatry* 51(1994): 375-382.
18. Pope, *Adonis Complex*, xiv & xv. The fitness movement of the last twenty years or so, Pope and his colleagues argue, has brought us, "compulsive exercising, soaring rates of anabolic steroid use, exploding sales of nutritional supplements, proliferating cosmetic treatments for men, and the birth of dozens of magazines and other publications devoted to male 'fitness' and 'health.'"
19. Harrison G. Pope, Roberto Olivardia, Amanda Gruber and John Borowiecki, "Evolving Ideals of Male Body Image as Seen Through Action Toys," *International Journal of Eating Disorders* 26(1): 65-72; Roberto Olivardia, Harrison Pope, John Borowiecki and Geoffrey Cohane, "Biceps and Body Image: The Relationship Between Muscularity and Self-Esteem, Depression and Eating Disorder Symptoms," *Psychology of Men and Masculinity* 5(2): 112-120; R.A. Leit, Harrison Pope, and J. Gray, "Cultural Expectations of Muscularity in Men: The Evolution of Playgirl Centerfolds," *International Journal of Eating Disorders*, cited in Pope, *Adonis Complex*, 40-42.
20. Pope, *Adonis Complex*, 40-42; and Pope, Olivardia, Gruber & Borowiecki, "Evolving Ideals of Male Body Image," 65-72.
21. Stephen S. Hall, "The Troubled Life of Boys: The Bully in the Mirror," *New York Times*, 22 August 1999. Viewed on 28 March 2008 at: <http://query.nytimes.com/gst/fullpage.html?res=9A02E2D91E39F931A1575BC0A96F958260>.
22. "Ronnie Coleman Wins 7th Mr. Olympia," *FitnessSource1*, at http://www.fitnesssource1.com/olympia_2004/olympia2004.html on 15 May 2008. At the 2004 Mr. Olympia, which he won, Coleman weighed in at 296 pounds.
23. Dianabol, the first anabolic steroid, began to be manufactured in 1958 and then quickly spread into the athletic community.
24. To certify that the subjects had never used anabolic drugs, Pope and his colleagues relied on interviews with the subjects and a follow-up urine test. Fifty-two of the steroid users (67%) had used steroids within the previous year. Kouri, Pope, Katz, and Oliva, "Fat Free Mass Index," 223-224.
25. Jan Todd and Terry Todd, "Chapter Three: Reflections on the Parallel Federation Solution to the Problem of Drug Use in Sport," in Thomas Murray, ed. *The Use of Performance-Enhancing Technologies in Sports: Ethical, Conceptual, and Scientific Issues* (Washington: John Hopkins University Press, forthcoming in 2008).
26. Kouri, Pope, Katz, and Oliva, "Fat-Free Mass Index," 224.
27. Pope, *Adonis Complex*, 37.
28. John Hansen, *Natural Bodybuilding* (Champaign, IL: Human Kinetics, 2005).
29. Information on Dave Goodin can be found at www.texasshredder.com, viewed 12 May 2008.
30. Pope, *Adonis Complex*, 36 & 37.
31. *Ibid.*, 38.
32. There is a branch of physical anthropology that works with body composition measures from photography that is used at times in forensic situations. Neither Pope or the Todds employed this method.
33. Pope was not able to obtain photographs of Jim Park, Mr. America 1952, or Ray Schaeffer, Mr. America 1956. Some photographs used by Pope for this project were supplied by Terry Todd.
34. Harrison Pope to Jan Todd, email communicate, 30 March 2008.
35. John Fair is a member of the North American Society for Sport History and attended the lecture in Lake Placid. In his book, *Muscle-town USA: Bob Hoffman and the Manly Culture of York Barbell* (University Park, PA: Penn State Press, 1999), Fair writes: "It was Grimek's classic physique that brought visibility and financial success to York . . . in his heyday, he became almost a cult figure. Grimek's was the image that sold magazines and fired the blood of the young men of America." p. 63.
36. John Fair, "Mr. America: Idealism or Racism: Color Consciousness and the AAU Mr. America Contests, 1939-1982," *Iron Game History: The Journal of Physical Culture*, 8(1) (June/July 2003): 10.
37. The evolution of bodybuilding training is discussed in detail in: Joe Weider, with Terry Todd and Jan Todd, "Chapter 4, The Weider System," *Bodybuilding As I've Seen It* (Austin, TX: University of Texas Press, Forthcoming).
38. Dr. Jack Berryman teaches in the Medical School at the University of Washington and served as President of NASSH from 1989 to 1991.
39. Lou Schuler interview dated 18 February 2005. Viewed at: <http://stlcardinals.scout.com/2/353285.html>. See also: Jeremy Likeness, "Ten Fat Mistakes," at: <http://www.bodybuilding.com/fun/likeness10.html> on 4 April 2008.
40. Ron Kroichick, "One Size No Longer Fits," *The Sporting News*, 223(27) (5 July 1999)12-16; "Sizing Up The Sluggers: My How They've Grown," *The Sporting News* 231(22) (23 May 2007): 27; and, E. J. Mundell, "Supersized in the NFL," at: <http://news.healingwell.com/index.php?p=news1&id=524269> viewed on 10 May 2008.