

From Tip to Tail

A Brief History of Ski Equipment



Photo courtesy of the Aspen Historical Society

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1998-9 Aspen Historical Society research intern



“Skeeing is indeed a glorious sport. It never grows tame or uninteresting, the exhilarating joy of it is a delight beyond all comparison. Skees make locomotion over the snow wonderfully easy and enjoyable. As the experienced skior dashes down the crusted hillside with the speed of the wind, there comes to the sport an added exhilaration and excitement that positively knows no equal.”

—Theodore A. Johnson
The Winter Sport of Skeeing
America’s first book about sport skiing, published
in Portland, ME, in 1905.

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Friedl Pfeifer at Alta, Utah in 1940. Photo courtesy of Aspen Historical Society.

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INTRODUCTION



*Dick Durrance on Aspen Mountain,
Miggs Durrance Photo, c. 1950*

Sometimes for sport, other times for survival, humans have continually relied upon the simplicity of the ski to conquer brutal terrains of snow and ice. While no one knows exactly when and where the first skis were used, archeological evidence suggests that where man and snow existed simultaneously, skis have almost always been present.

The earliest known skis bear little resemblance to today's high-tech marvels. Flat, stout and paddle-like, these primitive planks were used solely for the purpose of traversing. Their simplistic design demonstrates little more than the desire of the ancient skier to stay on top of the snow. It wasn't until skis were designed for war that the basic design changed. In response to this evolution, other items, such as bindings, boots and poles, used in connection with the ski, began to advance as well.

Over the decades, the development of ski equipment has been phenomenal. From wood to metal to fiberglass skis, soggy Mickey Mouse style boots to high-tech plastic buckle boots, and baggy to form-fitting Gore-Tex, ski equipment has become just as specialized as the sport itself.

The following pages will provide an in depth look at the historical development of ski equipment from prehistoric to present day. Specific attention will be paid to both technical and technological breakthroughs along with the notable influence of the world's social and political climate, all of which have played pivotal roles in advancing the sport to its present day super-status.

Chapter I

THE BEGINNING

Although the history of modern ski equipment begins in the nineteenth century, the earliest ski equipment can be traced back thousands of years to the prehistoric peat bogs of Scandinavia. The oldest known ski, unearthed in a peat bog near Hoting in the Swedish province of Angermanland, has been dated by pollen analysis to the year 2500 BC. The ski is 111 centimeters long, 9.5 to 10.4 centimeters wide, and ranges in thickness from one centimeter at the tip to two centimeters at the middle, where a footrest was hollowed out and a hole for a primitive binding cut into the side.¹

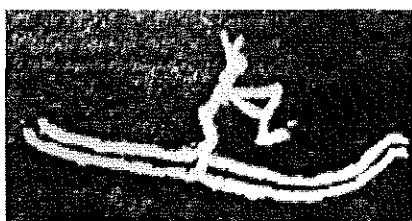
Further evidence suggests that skis have existed even before the Hoting ski. According to carbon dating analysis, a rock carving at Rodoy, Norway depicting a skier on the hunt dates back to 2500 BC and the oldest known sled-runner, a close cousin of the ski, dates back to 7000 BC.

Literary references to skiing date as far back as 400 BC. The first mention is made by Xenophon, the Greek historian, essayist and military leader, centuries after their invention and spread through Scandinavia. Later written references occurred at a rate of roughly one each century from 552 AD until 1555. These include Egil Skallagrimsson's 950 AD saga describing King Haakon Adalsteinsfostre the Good's practice of sending his tax collectors out on skis, and Swedish diplomat Olaus Magnus' lengthy 1555 AD description of the ski itself.

Skiing for Survival

As early archaeological finds demonstrate, prehistoric skis were predominantly used as a matter of necessity. The very first skiers didn't ski for fun, they skied to live. Basic survival in Northern Scandinavia involved hunting and fishing. Reindeer, especially, provided the early Norsemen with food, clothing and materials to make tools. Because reindeer followed the ice lines of the receding glaciers, so did the hunter. It is widely believed that these early Scandinavians traveled on skis.²

Later historic evidence affirms that Scandinavians also found skis to be useful during times of war. Skis are first mentioned in wartime use in 1200 BC when King Sverre of Norway ordered Pal Belte and other local civilians to spy on enemy positions near Ryenbergene, and again during the Norwegian civil



Rodoy rock carving of an early skier dating from 2500 BC. Photo courtesy of 9,000 Years of Skis.



Scandinavian warrior. Illustration courtesy of 9,000 Years of Skis.



The Birkebeiners, an 1853 painting by K. Bergslien of the flight of the "Birchlegs" with the infant king Hakon Hakonsson in the 1206 Norwegian Civil War. Photo courtesy of America's Ski Book.

war in 1206 BC when two scouts on skis carried the infant king Hakon Hakonsson over the mountains from Gudbrandsdal to safety in Lillehammer. This event is memorialized in the annual Birkebeinerne cross-country ski race, named after the birch leggings the scouts wore.³

Skis continued to be a defining characteristic of the Norwegian military throughout the years. It was, in fact, Colonel Jen Henrik Emahusen, a Norwegian ski troop commander, who published the world's first ski book in approximately 1733. The publication, handwritten in German, designated the proper length of skis—270 centimeters for the left foot and 210 centimeters for the right—and outlined a complete seventy-two step military rifle drill on skis. Emahusen's regulations were expanded and updated three times—an illustrated edition appeared in 1765, and a Norwegian edition was published in 1774. In the early 19th century, following Sweden's loss of Finland to Russia in 1814, the use of skis in the military began to decline. By 1826, both the Swedish and Norwegian ski troops ceased to exist altogether.⁴

Skiing for Fun

Though skis themselves may have existed for over nine thousand years, the first evidence of skiing for anything other than utility is no more than a thousand years old. Famed ski historian Morten Lund maintains that Icelandic poetry known as the "Eddas," composed around 1000 AD, illustrates that, in addition to utility, skiing was also a sport of racing and wagering, as well as an attribute of an aristocrat. The "Eddas" alluded to fast skiing as a particular accomplishment of Viking King Harald Hadrade (1046-1066) who frequently raced for victory rather than necessity.

Eight hundred years later in the early publication *Geographie*, Father Knut Leem, a Danish traveler, reported children in Norway trying to pick up a hat dropped on the slope while skiing down as fast as they could. The publication states that "In Norway, it is common for kids to practice skiing so extensively that even along the coast of Norway, where there is no practical need for them, skis are used for fun."⁵

From Norway to North America

While some historians argue that skis were first brought to America by Lief Ericson and his men in the year 1000, the first recorded use of skis in the



SNOWSHOE THOMPSON

The most famous of the early High Sierra Skiers in California was a man named John A. "Snowshoe" Thompson. Thompson left his native country of Norway in 1837 when he was ten years old. He arrived in California in 1851 with high hopes of finding his fortune in gold. Instead of mining or panning, Thompson ended up ranching or cutting wood to make ends meet (accounts differ).

At this time, during the worst months of winter, communications between the east and west sides of the Sierras was cut off due to deep snow drifts. Finding no fortune in gold, Thompson answered a call from the United States Government requesting volunteers to carry mail across the mountains. Having skied before in Norway, Thompson chopped down an oak tree, fashioned a 25 pound pair of skis and set off on his first expedition.

On January 3rd, 1856 he headed east over the mountains from Placerville. He skied 90 miles to Genoa in the Carson Valley on the other side of the mountains and returned to Placerville on January 18th. The return trip took only three and one-half days.⁶

continued...

United States occurred in 1841 in Beloit, Wisconsin, a region in the mid-west settled by Scandinavian immigrants. In Beloit, as in Europe, skis were first used for transportation and hunting, rather than sport.

This would change upon the arrival of the Scandinavians to the mining camps of California's High Sierra's during the great goldrush of 1849. Lured by the promise of wealth, Norwegian immigrants came to California in droves. They soon discovered that, come winter, the High Sierra mining camps were covered with ten to fifteen feet of snow. Skis, or Norwegian Snowshoes as they were commonly called, were the only effective means of transportation.

Days of Dope and Snowshoes

While skis were an essential aspect of winter survival in the High Sierras, it was only a matter of time before they were used to provide recreation as well. In an effort to break the monotony of the long, dull winters, mining camp residents began competing for speed in downhill "Snowshoe" races. These Norwegian Snowshoe races, sponsored by the occupants of the Sierra gold mining camps, were the first downhill skiing competitions to be held in the United States. The first match-ups, held in about 1860, were very informal affairs. Within a short period of time, however, these casual races for fun exploded into hotly contested regional events.⁸

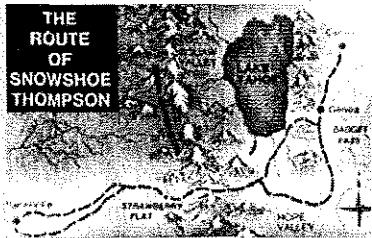
Equipped with twelve-foot-long skis crudely fashioned from boards of hickory, ash or pine, the racers organized teams from among the various mining camps and challenged each other to races on courses that shot straight down the open mountainside. Standing at the sides of these courses were hundreds of spectators who cheered them on and wagered upon their success.⁹

The race itself was similar to a track event. Jumping at the sound of a gong, several skiers at a time pointed their skis downhill and raced towards a finish line marked by American flags and portable bars. Stopping was achieved by dragging a single, heavy pole across a "mercifully long outrun beyond the finish." Turning was unnecessary, if not impossible.¹⁰

Snowshoe races of all types were held. These included races for women, races for Chinese laborers and "Tom Thumb" races for children. Women's races, however, typically didn't bring high speeds as the women were forced to ski in an upright position in order to prevent their skirts from flying up over their heads.

Over the next twenty years, Snowshoe Thompson continued to carry mail over the treacherous snowy Sierras. He braved blizzards and freezing cold temperatures, averaging 36 miles a day despite the burden of a mail pack that often weighed as much as 100 pounds. During the winters of the early 1860's he was the only land link between California and the east coast.⁷

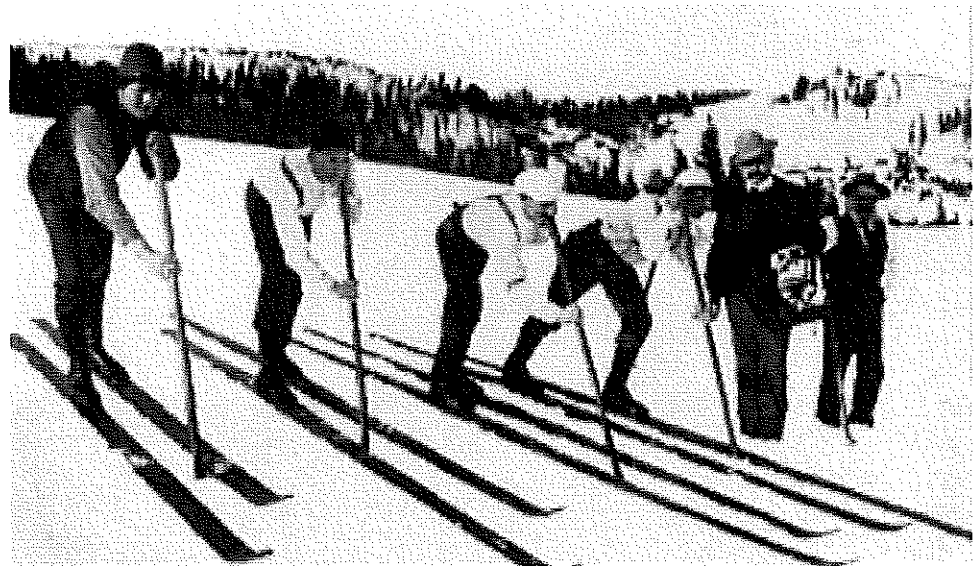
Eventually Thompson's services were replaced by stage and the railroad, a fact that never sat well with Thompson. Right up to his dying day Thompson battled with the United States Post Office claiming that they owed him thousands in back pay. He died before ever receiving a settlement.



With speed as their primary objective, the racers constantly worked to improve their equipment and technique. They developed grooved skis fastened with leather straps and they created a strange and mysterious substance called "dope," a tar wax composed of bees' wax, human sperm, spruce oil and various other adhesive ingredients. This was applied to the bottom of the ski to increase speed by preventing snow from sticking. They also invented a low crouch to fight wind resistance.¹¹

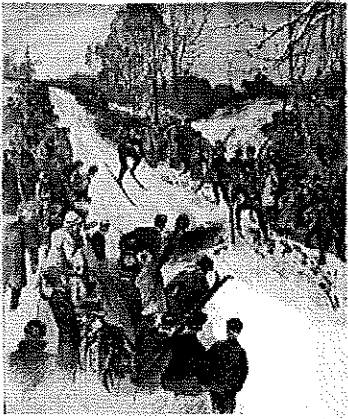


Snowshoers in Gunnison County, Colorado, March 1883. Photo courtesy of Denver Public Library.



"Doped up" and ready to start at the sound of the gong. Photo courtesy of The Art of Skiing.

THE GRAPHIC



A Feb. 1893 edition of The Graphic, published in Chicago, Illinois demonstrates the nationwide fascination with high-speed (snowshoe) races. Photo courtesy of The Art of Skiing.



Early ski racers showing the crouched position.

These developments proved to be quite effective. The top speeds reached by the Sierra Snowshoe racers were impressive even by today's standards. In 1874 a California racer named Tommy Todd set a record with a speed of approximately eighty-eight miles per hour, faster than anyone would ski for the next fifty years.¹²

By the late 1860s Snowshoe racing had spread eastward to Colorado's mining camps, as well. As a result of the popularity of these early ski races, miners and early settlers not only found the courage to remain in the camps during the most unbearable months of the winter, they also managed to attract countless others to the area just to take part in the events. Bill Berry, a western writer from Reno, Nevada believes that if it weren't for the Snowshoe races, the early conquest of the Western mountain states might not have been possible.

Picking up Speed—the Birth of Modern Downhill Skiing

Although Scandinavian immigrants are given credit for bringing their primitive skiing skills to the United States, it was in the Alps towards the end of the 19th century that modern downhill skiing first came to be. Two Austrians in particular are credited for its birth. Their names are Mathias Zdarsky and Hannes Schnieder.

Mathias Zdarsky, a retired school teacher and a native of Austria, ordered his first pair of skis after reading a book written by explorer Fridtjof Nansen who had crossed the Greenland ice caps on skis in 1888. Zdarsky believed that skis might offer an effective means to get into town during the winter. Because his skis came with no instructions, Zdarsky was forced to develop his own technique. Over a short period of time had taught himself how to ski. In 1892, believing that others might benefit from his new found abilities, Zdarsky founded the first ski school in Europe.

In 1896, Zdarsky took Norwegian skis and Norwegian downhill ski methods and proceeded to develop the world's first *system* of skiing technique. On a hill in Lilienfeld, Austria, Zdarsky invented the crouching turn and the snow-plow, made standard the use of two poles instead of one, and became the world's first ski instructor. His method became known as the Lilienfeld Method.¹³

Hannes Schnieder, another native of Austria, learned Zdarsky's technique and improved upon it with his own revolutionary "Arlberg Method," a systematic technique that led skiers through the snowplow, the stem-christiania and

eventually on to parallel turns. Schneider signed up as a full-time ski instructor at St. Anton in 1907. There he continued to develop the technique that eventually came to dominate the skiing world.

As downhill skiing grew in popularity and more and more people learned to ski, the demand became greater for more reliable equipment. The primitive boards of the past were no longer effective. Downhill skiers needed equipment that could accommodate and endure greater speeds. As a result the decades to come would see remarkable advances in ski technology.

HANNES SCHNEIDER



Photo courtesy of Skiing Heritage, Fall 1994

Hannes Schneider was originally apprenticed by his father to be a cheese maker. Hannes' passion, however, was the snow. He loved to ski and he loved to teach others how to ski. According to Richard Needham of *Ski Magazine*, "Schneider had vision, an uncanny analytical ability, a sense of the dramatic, and, above all, the ability to put himself in the skiers, particularly the beginner's, boots."¹⁴

During World War I, Schneider enlisted as a ski instructor for Austria's alpine troops. Using military discipline, Schneider was able to train novices into worthy skiers in a matter of only weeks. Schneider's method was an easy technique that led skiers through the snowplow, the stem turn, the stem-christiania and eventually parallel swing turns.

After World War I, at his Arlberg ski school in St. Anton, Austria, Schneider combined a logical skills progression method with the regimented discipline used for the military to teach thousands of people to ski for pleasure. His primary rule was "safety first, speed later." According to James Champion, director of Dartmouth's Ski Shop in 1939, skiing truly came into its own as a direct result of the technique taught by Schneider at the famous Arlberg School. Champion claims that this technique made it possible to negotiate the steepest slopes with control thus bringing skiing out of the hazardous class and into a sport that everyone could enjoy.

Schneider is also given credit for training some of the world's most legendary ski instructors including Luggi Foegger, Otto Lang, Berno Rybizka, Sepp Ruschp and Aspen's own Friedl Pfeifer. Each of these men would immigrate to the United States following Hitler's rise to power. Schneider initially chose to stay in Austria but was arrested by the Nazis following the Anschluss of 1938. As a result of the relentless efforts of Harvey Gibson, a New York banker and financial backer of the cog-operated ski mobile at Mount Cranmore, New Hampshire, Schneider was imported to the United States where he continued to teach.¹⁵

Chapter II

SKIS



The "hoting ski."
Photo courtesy of
9000 Years of Skis.

For thousands of years ski technology remained primitive. Skis were made of single pieces of carved wood featuring an upturned tip and fastened to the foot with a leather toe strap. As Ted Bays points out, in his book, *Nine Thousand Years Of Skis*, many different classifications exist for prehistoric skis based upon their shape but they all have one thing in common—they were designed for cross-country transportation, not downhill running.

Not surprisingly, it was the Norwegians, both in Scandinavia and in their new homes in North America, who first practiced the sport of skiing. Although competitive skiing began in Norwegian military units in 1767, the first open races for civilians took place at Tromstoy in 1843. Despite growing interest, however, skiing was not considered a sport suitable for the average person. Within two decades Sondre Norheim and fellow skiers from Telemark, Norway would ultimately change this perception.

Turning to Telemark

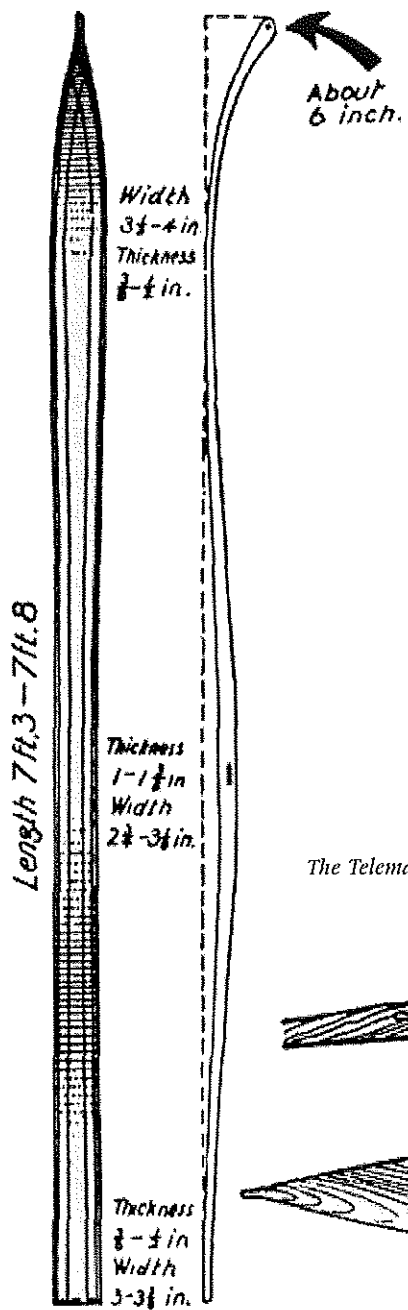
In the mid-19th century the predecessor of the modern downhill ski made its debut in Telemark, Norway. Unlike many other styles, the Telemark ski, so named for the city of its origin, was long and thin and it possessed sidecuts which meant that the ski's tip and tail were broader than its waist. This design gave the ski the ability to turn when it was set on edge.

Just as significant was its new binding, invented by Telemark's Sondre Norheim. Instead of the old leather toe strap, Norheim crafted a binding out of twisted roots that formed a loop around the heel of the boot providing the skier with unprecedented control.¹⁶

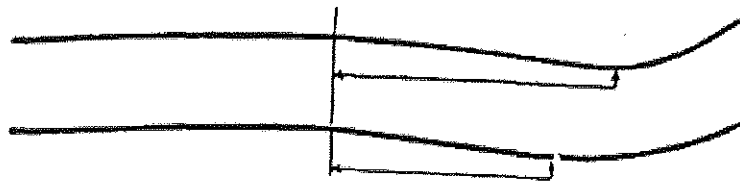
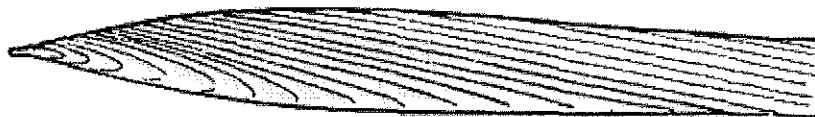
By the late 19th century, the Telemark ski had become the standard for the growing ski industry. Primarily hand manufactured by individual craftsmen throughout Telemark and Scandinavia, the Telemark ski was anywhere from six and a half feet to eight feet long. It was three and a half inches wide at the bend tapering to two and three quarter inches at the toe-strap hole, then widening again to three inches at the rear. In some regions, the right and left skis were made symmetrically different and the skis of a pair were nailed together during construction. These skis can be recognized by the holes that are still present at the tips and tails.¹⁷ (Not to be confused with the holes present at the tips of 10th mountain issue skis. These skis were designed to double as tent poles or sled runners.)



1915 European telemark poster. Photo
courtesy of The Art of Skiing.



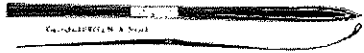
The Telemark Ski construction




Ski and Ski Accessories
AND TOBOGGANS

ESTABLISHED BY
MARTIN A. STRAND
NEW RICHMOND, WISCONSIN

For Long Distance Please Call Newark, New Jersey Number 52
Send for Price List To Any Ski Equipment Dealer, Club and Agents




CHARLES E. STRAND



**Which do you think speaks the loudest,
actions or words?**

Have you ever gone to a Ski Tournament, and if you have, did you notice that the great majority of expert skiers use "the STRAND CHAMPION SKI," so-called because it has taken some Championships during the last few years in this country than any other ski made? Is this not a stronger argument why you should use the Strand Ski than any other talk I can put up? I also make special designs for those who wish it and will be glad to give you any information that you want if you will kindly write me.



These Bindings
are made double and stitched, either with or without the best improved ratchet device, and also single for light cross-country work.

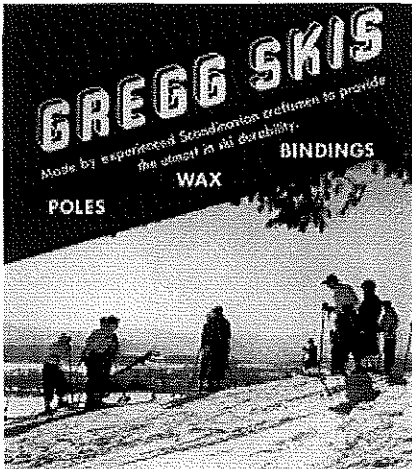
Strand Ski accessories ad.

Compared to the earlier Nordic skis which were wide and awkward, the Telemark was lean and graceful. It possessed gently curved sides for better control and turning ability, a narrow waist and a symmetrically cambered middle to evenly distribute the weight of the skier, and a flared tip and tail to cut a smooth path through the snow. The cambered sides also permitted better steering on downhill runs. In fact, the curved sides of the Telemark ski increased turning efficiency to such an extent that the two turns developed following its introduction, the Telemark turn and the stem-Christiania turn, became the foundations of two very popular skiing styles and the main instigators in an international war of ski techniques!¹⁸

Just as important as the basic design of the ski was the wood used in its construction. Henry Hoek, an expert in telemark ski design during the period of its introduction and author of the 1910 publication, *How To Ski*, gives this brief description of the ideal types of wood to be used in construction along with the ideal shape the wood should assume:

"The choice of wood must be limited to ash and hickory. It should be thoroughly seasoned, but not brittle. The grain must run parallel to the length of the ski, and cross grain either way should be rejected. As a rule, the length of the ski should be such that when standing on its end the point can be touched with the fingertips. The upward curve of the points and the upward arching of the middle of the ski should never be exaggerated, and what is even of more vital importance, the upward curve of its points should never be abrupt."¹⁹

Although the best Telemark skis were made from compressed pine, early hand crafters used everything from oak to ash depending upon availability. The first hickory skis appeared in 1882. Eventually hickory would come to dominate the wood ski industry. Interestingly, for Europeans, this preference for hickory would lead to a reversal in exports. Hickory trees, once native only to Europe, disappeared from the continent altogether and had to be secured from the United States where they had been introduced earlier in the 18th century.²⁰ This reversal probably explains why many Norwegian ski manufacturers chose to locate their factories in the United States.



TO STEP UP PRODUCTION & MORALE

Many a defense plant will organize skiing parties for the workers this winter. Many youngsters will take up the sport for the first time. Beginners will find it wise to use what experienced skiers do to work out Gregg equipment. This is Army demands your dealer's stock may be sub-standard in quantity — but never in traditional Gregg quality!



Photo courtesy of Pictorial History of Downhill Skiing.



Photo courtesy of The Art of Skiing.

Early Ski Manufacturing

Originally skis in both Europe and North America were designed by individual craftsmen. Some were specialized like the twelve-foot-long Norwegian Snowshoes used by the Sierra racers in California. Others were little more than fence boards shaped by dipping the tips into a bucket of water while tying the tail to the branch of a tree.

When skiing grew more popular following the introduction of the Telemark ski, it became impossible for hand crafters to produce skis fast enough to meet the growing demand. This left factories to assume the responsibility.

The first ski factory in Europe was established in Norway in 1886. Gunerious Schou, a carriage maker from Lillestrom, brought a thousand pairs of machine manufactured skis to Christiania to sell to the growing number of ski enthusiasts. Schou was so impressed with the market that he decided to move to Christiania and set up a permanent shop.

Rustad of Faberg, another well known hand ski crafter in Norway, decided to convert his ski shop to machinery that same year. By 1910 factories from Germany to the United States were producing several variations of the Telemark ski. The Telemark continued to illustrate the standard in ski design until the mid 1930s when Swiss designers began to develop more specialized models for slalom racing.

American Ski Manufacturers

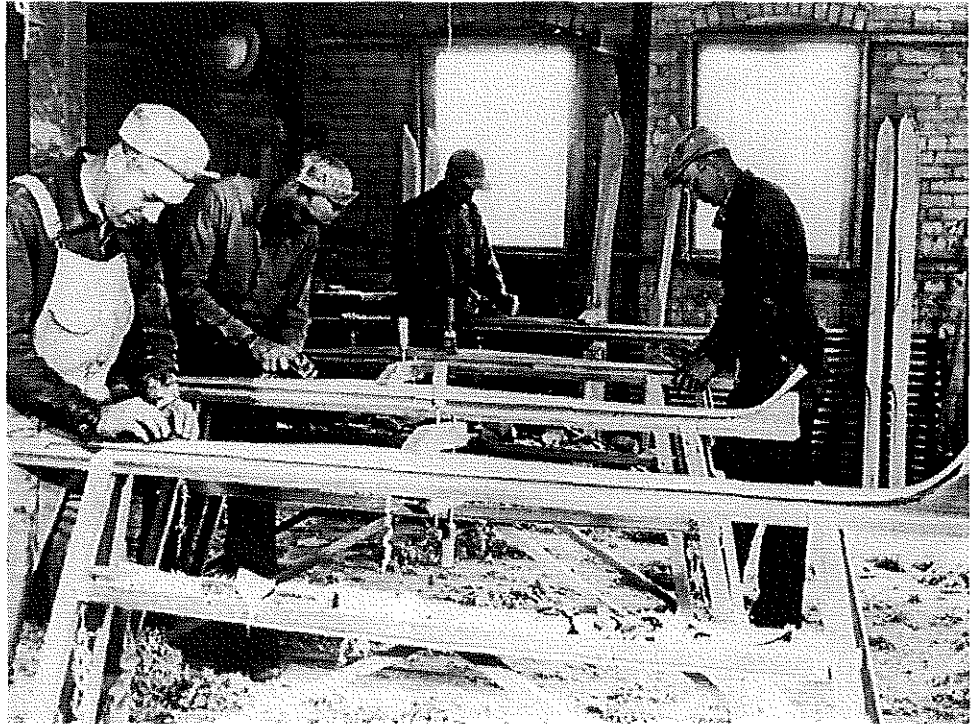
Not including the La Porte cabinet shop in California, which manufactured eight to fourteen feet long "Norwegian Snowshoes" for the Sierra snowshoe racers during the mid 1800s, it is generally believed that the first large United States commercial ski factory emerged in St. Paul, Minnesota in 1879.

Martin A. Strand, the company's founder, began manufacturing skis believing he could capitalize on the new ski clubs that were beginning to form in Red Wing, Minnesota and Ishpenming, Michigan. He modeled his skis after the popular Norwegian Telemark ski as did most ski manufacturing companies of the period. Strand's skis were carved from a single piece of wood and had wooden edges and bottoms that required wax to prevent snow from sticking. Later models included skis specifically designed for jumping and cross-country racing.

The success of the Strand Ski Company established St. Paul as the center for American ski manufacturing, a reputation that was enhanced by the arrival



Photo courtesy of Pictorial History of Downhill Skiing.



Groswold Factory, Denver Colorado, 1932.



Photos courtesy of Pictorial History of Downhill Skiing.

of the Northland Ski Manufacturing Company, Gregg Ski Manufacturing Company, and much later, Hart metal skis.

Northland Ski Manufacturing Company, formerly C.A. Lund Company of Hastings, Minnesota founded by Norwegian born C.A. Lund, began producing skis, toboggans, snowshoes and hockey sticks shortly after Lund's arrival from Norway. Lund's skis soon gained a widespread reputation for unsurpassed quality making Northland the largest manufacturer of skis in the world. The Strand factory later moved to New Richmond, Wisconsin.²¹

Further west, pioneer ski manufacturing companies included Anderson & Thompson Incorporated located in Seattle, Washington and the Groswold Ski Company of Denver, Colorado, founded by the Norwegian born champion ski jumper, Thor Groswold in 1932.



Early metal edges on Aspen Mountain's Lift-1, c. 1950 Photo courtesy of Aspen Historical Society.

Skiing on the Edge

Although the continual quest for greater speed gave way to new breakthroughs in binding technology during the first decade of the twentieth century, the basic design of the ski itself remained relatively the same until the invention of ski tows and chair lifts during the 1920s and 30s. This new found ability to reach greater heights inspired a series of new developments in ski design.²² Perhaps the most innovative of these developments was the steel edge, an invention popularly attributed to a man named Rudolph Lettner.

In 1928, Lettner, an Austrian metal worker and skier, was looking for a way to protect the sides and bottoms of his skis from the damage incurred during regular use. After experimenting with various reinforcing materials ranging from wood to cloth, Lettner eventually outfitted the bottom and sides of his skis with thin strips of metal believing that it would increase their durability.

Not only was his experiment a success, but the metal edges encouraged a change in technique by enabling the skier to carve into a turn where he had merely slid into one before. In addition, the ability of the metal to bite into the snow allowed for a more defined forward lean position which encouraged the skier to reach greater speeds with unmatched precision.²³

Despite their obvious advantages, however, steel edges did not immediately win over the skiing population. There were serious disadvantages to the early edge—it could cut a skier's leg and it didn't glide well over wet snow.

The first improvements came in the form of a synthetic "glue" which was applied to the groove where the steel was connected to the wood. This limited the interference of the metal with the gliding surface of the wood. Later improvements came in the form of jointed edges, screwed in edges and hidden edges. It wasn't until the later development of polyethylene, however, that metal edges reached their peak performing abilities.²⁴ Following the introduction of plastic and fiberglass in ski design, the edge became less of an accessory and more of an integral part of the entire base of the ski.

Initially, skis made of anything other than wood failed to attract the attention of the general skiing public. Nevertheless, scientists, inventors and ski manufacturing companies, encouraged by the widespread use of metal edges, continued working on designs featuring laminations, metals and synthetics. Within twenty years, their efforts would revolutionize the sport again.

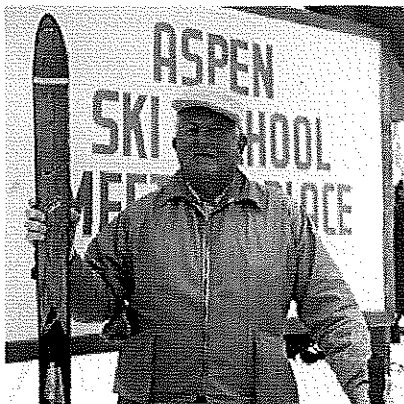


Laminations

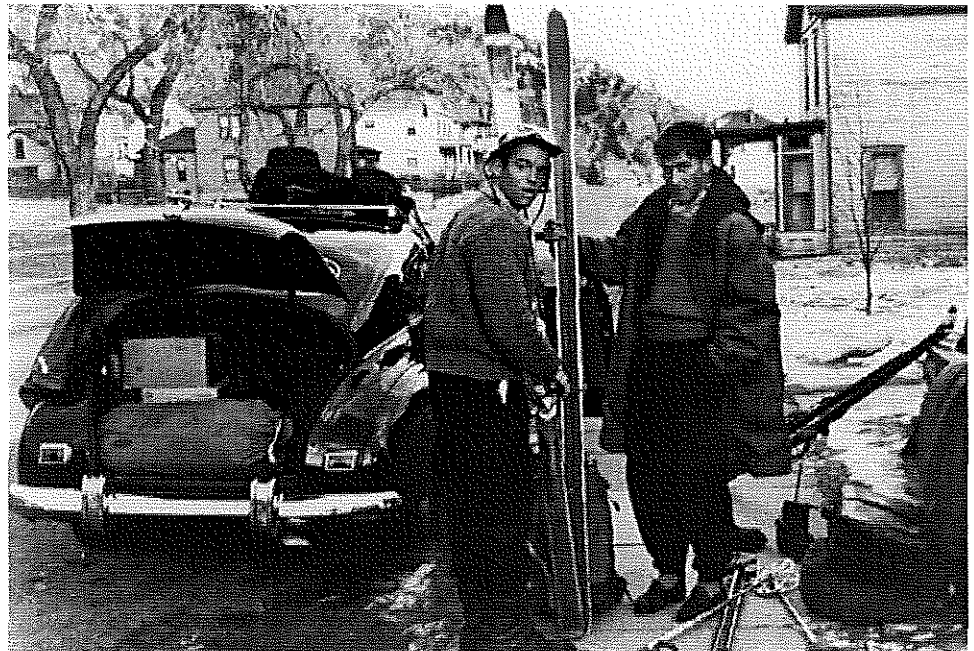
Although the first laminated skis were developed in the 1890s, they did not garner immediate interest. It wasn't until 1932, when a layered ski that featured a hardwood hickory bottom with a softwood top of ash or pine was introduced, that laminated skis finally grabbed the attention of the ski world. This combination provided the advantages of lightness and durability with the added benefit of torsion strength.²⁵ After the initial success of this two-ply ski, it was only a matter of time before three-(or more) ply skis were developed.

At about the same time the laminates were evolving, the bakelised ski was invented. The base of this ski was coated with a synthetic resin called Bakelite that, when hardened, "blocked the pores of the wood thus making it stronger while enhancing its gliding capabilities."²⁶

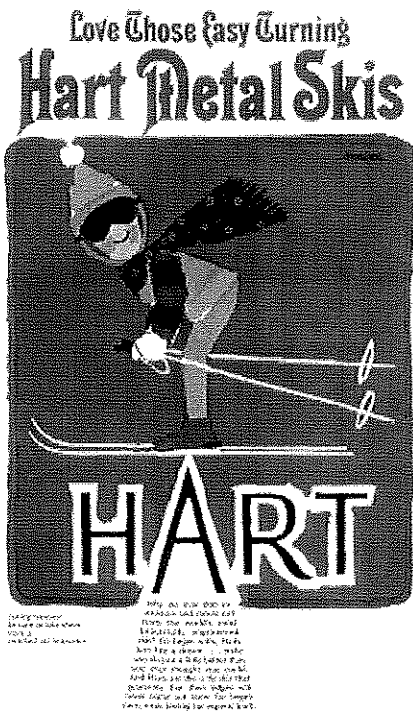
The truly complex laminated skis didn't hit the market until 1939, when chemists invented a glue strong enough to hold the various laminations together permanently. These skis were constructed with thin layers of wood that were glued together in narrow strips called "cane" throughout the entire length of the ski. The process was thus referred to as "split cane" construction or *Splitkein* in Norwegian. Licensing rights to produce Splitkein skis in the United States were obtained by Thor Groswood, of Groswood Ski Manufacturers in Denver, Colorado and Northland ski factory in Saint Paul, Minnesota.²⁷ Ac-



Beginning in 1932, different types of wood were laminated together to create a stronger, lighter, and more flexible ski. Photo courtesy of Aspen Historical Society.



Right: Pete Seibert and Joe McNealus take their laminated skis on the road with the Aspen Ski Club, 1947. Photo courtesy of Aspen Historical Society.



Head was not the only American-made metal ski on the market in the 1950's. In 1955, Harry Holmberg, a former employee of the Gregg Ski Company in St. Paul, got together with Hartrig Holmberg and Ed Bjork to manufacture metal skis under the brand name Hart. For a time, Hart was one of the leading names in the industry. Photo courtesy of Ski Magazine.

According to Peter Lunn in the *British Ski Year Book—1939*, the new laminated skis were far superior to solid hickories because they were lighter and stronger, they would not warp, each ski in a pair was exactly like the other, and they were undeniably faster.²⁸

Soon experts all over the world began to acknowledge the benefits of laminations. By 1951 laminated skis made up ninety percent of all ski production.²⁹ It became common lore on the slopes that the more laminations you had the more advanced a skier you were.

Metal Skis

Regardless of the overwhelming success of laminated skis, some designers continued to believe that metal was the ski material of the future. The first attempts at metal ski design brought forth the Sixty Sales Corporation's, Alu-60, which was designed by the Chance-Vought Aircraft company in 1947, the Dow Metal Air Ski, and the All Magnesium which made its debut at Austrian instructor Sepp Ruschp's Ski School at Stowe in 1942.³⁰

These early models met with only limited success. Because their metal bases wouldn't hold wax and the ski itself would occasionally assume an unwanted shape, skiers referred to them as tin cans and ultimately refused to buy them.³¹ It wasn't until Howard Head tried his hand at ski manufacturing that metal skis would take the industry by storm.

HEAD Skis

In 1947 Howard Head, a 32-year-old aircraft engineer, went on a skiing vacation in Stowe, Vermont. He had only skied a couple of times before and, although he enjoyed the experience, he found his equipment to be slightly unsatisfactory. Convinced that he could develop a better ski, Head took \$6,000 in savings and poker winnings and rented a corner shop in Baltimore. There he produced his first metal ski, a "metal sandwich" of aluminum surrounding a core of honeycombed plastic. This first ski, however, failed before it even made it to the slopes. It broke in the hands of Stowe ski instructors who were testing its flexibility. Subsequent skis that did make it to the slopes performed poorly. Snow clumped up on the aluminum bottoms and the edges dulled much too quickly.³²

Head went back to his shop to try again. After a series of failures, he finally designed a ski with a plywood core, spring-steel edges, and a bottom

coated with phenolic plastic in addition to the original layers of aluminum. In the spring of 1950, Head took these latest skis up to the Headwall of Tuckerman's Ravine on Mount Washington. There he handed them to Clif Taylor, a young



"Clown Prince" Ralph Jackson and his Heads., c. 1955, Aspen, Colorado. Photo courtesy of Aspen Historical Society / Hiser Collection.

ski enthusiast. Taylor took the skis up to the top of the slope while Head, who wasn't a very good skier, watched him carve down the mountain. At the end of the run Taylor announced, "They're great, Mr. Head, just great." It was then that Howard Head knew he had created the right ski.³³ In 1955, Taylor invented the Shortee Shortskis to promote his Graduated Length Method of ski instruction.

Following his success at Tuckerman's Ravine, Head went on to develop an even more revolutionary ski. In 1955, he guided the future of skiing by experimenting with fiberglass reinforcing, polyethylene, and a vulcanized neoprene rubber that he inserted in the top skin of his aluminum ski to dampen vibrations at racing speeds.³⁴ The end result was a fine-tuned ski that won trophies in 1960 and granted F.I.S. (Federation Internationale de Ski) victories in 1962. Although the Head factories have since moved to Europe and no longer produce an all-metal ski, Head Ski Corporation still maintains its status as one of the world's foremost ski manufacturers.

Fiberglass

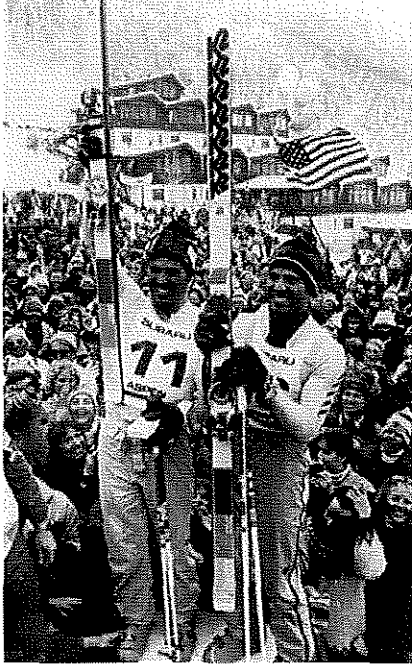
During the early 1960s, while most manufacturers scurried to produce their own versions of Howard Head's Aluminum sandwich ski, a small group of designers continued to experiment with fiberglass. Fiberglass was first used as a ski construction material in 1954 when Danforth Holley used it as a ski base and core wrapping component.³⁵ The Holley plastic ski had another unique feature—an L shaped edge that was molded, rather than screwed, into the base. According to Richard Needham, the original patent for Holley's plastic ski was sold to Attenhoffer, a Swiss ski manufacturer. The patent for the molded edge was sold to Howard Head, who used it in his famous metal skis.³⁶

Fiberglass appealed to manufacturers because it seemed to promise the ultimate in ski design. It was strong, it wouldn't warp when wet, it increased performance, and above all, it was resilient. This resilience meant better shock absorption, increased terrain-hugging ability, and the opportunity for the designer to change the flex pattern of the ski.³⁷

The first true fiberglass ski to hit the market was the Toni Sailer, introduced in the early 1960s by Fred Langendorf. This ski was not originally intended for commercial use. Langendorf, an engineer who was working with fiberglass at the time, just wanted to make a few pairs for his own use. When his friends Ernie McCulloch and Les Streeter tested the ski, they were so impressed that they talked Langendorf into going commercial with his new invention.³⁸ This was just the beginning for fiberglass ski construction. By 1961 five manufacturers—Rossignol, Sailer, Kneissl, Plymold and Veneko—produced laminated skis with fiberglass skins.

In 1962, Kneissl introduced its White Star fiberglass laminate, which was really a wooden laminate ski with a fiberglass casing.³⁹ The White Star, selling for the unheard of high price of \$195, became an overnight success. At the same time, other manufacturers began to see the future of fiberglass and worked to develop their own designs. K-2 introduced its first full fiberglass model, the Holiday, and in 1968 the French firm, Dynamic, produced the first fiberglass wrapped ski.

Dynamic's ski, the VR-17, differed from the earlier molded fiberglass skis in that it was constructed of fiberglass wrapped around an interior core. Another popular fiberglass on the slopes was the Rossignol Strato, also introduced in 1968.⁴⁰ By the end of the 1960's, fiberglass construction had progressed to the point where it began to out-perform and out-sell metal skis.



Phil and Steve Mahre finish first and second in Aspen World Cup Giant Slalom, 1981. Photo courtesy of Aspen Historical Society.

Present-day Ski Construction

Modern day skis still maintain the basic fiberglass design made popular during the late 1960's. The heart of the ski, the core, is often made of wood and sometimes of foam or another lightweight polymer material. The core is wrapped in fiberglass, which in turn is fully encased in plastic.

Until recently, skis had separate side walls and top surfaces. In 1989 Solomon and Elan introduced a new ski design with a one-piece cap on the top and sides. Although a few models featuring separate tops and sidewalls are still available, the majority of present-day skis are manufactured according to this one-piece fiberglass cap, or monocoque, design.

The base of every ski is still made of a glide-enhancing, polyethylene synthetic with steel edges imbedded into the sides. P-TEX, first introduced in the late 1940s, is the most common of the polyethylene ski base materials.

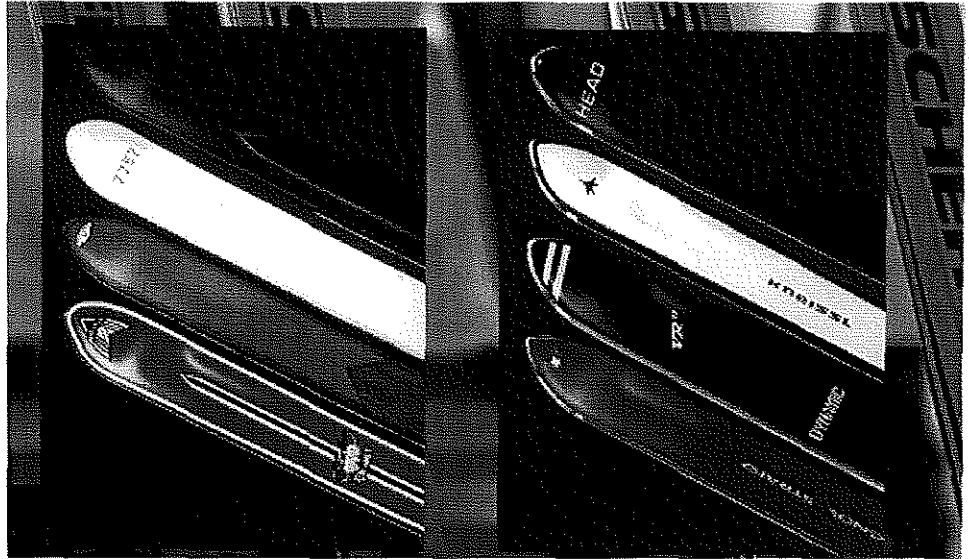
The components of the ski, along with the way they are assembled, affect the performance of the ski. Some skis are soft-flex models that possess a lighter touch and are more forgiving in the snow. Others are stiff and tight for hard-edge racing and skiing on ice and hardpack. Some are designed to handle the gradual turns made by beginners. Others are quick to respond to the powerful turns completed by racers. Specialty skis designed for different types of racing, powder skiing and freestyle skiing also exist, but the average recreational skier uses an all terrain ski.

Most skis are measured in centimeters. Conventional-length skis are manufactured in increments of five centimeters ranging from 175 to 210 centimeters depending, upon the model. The one thing that has radically changed in ski construction over the last decade is the actual shape of the ski itself.⁴¹

Shaped Skis

Today, the hottest skis on the market are those with incredibly wide tips and tails and narrow waists. These skis are known as shaped skis or super-sidecuts. The most aggressively shaped skis are referred to as hourglass or parabolic skis. These skis are anywhere from ten to twenty-five centimeters shorter than conventional models. Most Shaped skis are manufactured in just four lengths, from about 160 to about 180 or 190 centimeters. This makes them lighter and nimbler despite their width.

The first models to hit the market were the true parabolic skis originally designed to help beginners initiate a turn. Soon, however, all levels of skier



Classic Skis. Photo courtesy of 50 Years of Skiing in American.

were experiencing the advantages of the new design. Shaped skis helped the new skier learn to carve and they helped the intermediate learn to ride an edge. Even advanced skiers were finding the shaped skis versatile in varying snow conditions from powder to ice. Thus, in spite of the initial pessimism that surrounded their development, the new shaped skis were quick to take off.⁴²

In 1995-96 only a half dozen shaped skis from various manufacturers were introduced. Today, the market is slammed with nearly 50 different models from virtually every ski manufacturer in the world. The ski manufacturers whose products currently dominate the market are:

- Atomic
- Dynastar
- Elan
- Fischer
- Goode
- Hart
- Head
- Kastle
- Kneissl
- K2
- Olin
- RD
- Rossignol
- S Ski
- Salomon
- Stockli
- The Ski
- Volant
- Volkl

By the year 2000 it is estimated that shaped skis will represent more than sixty percent of all skis sold.⁴³

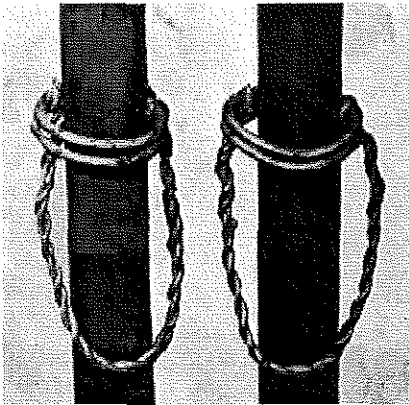


The ski shop's daily routine of maintaining and tuning skis. Photo courtesy of Aspen Historical Society.

Chapter III BINDINGS

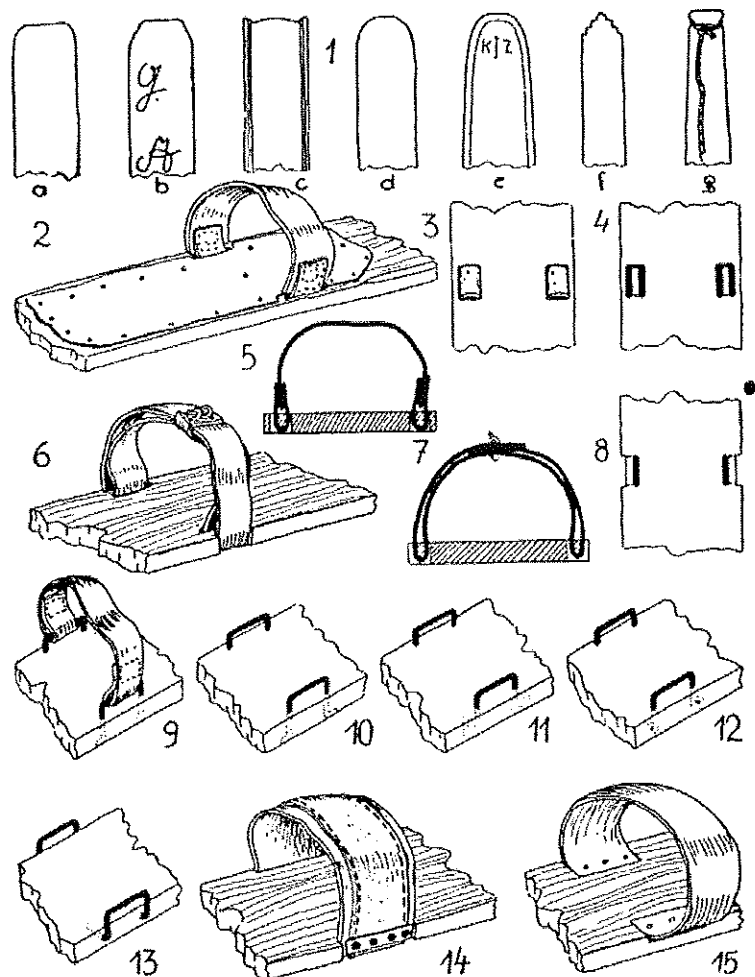
The binding, like the ski, has developed in two markedly different stages—“Nine millennia of Nordic simplicity, and a century of Alpine complexity.” The very first bindings were simple straps of leather or tree branches attached to a board. This basic toe strap design was primitive but effective in its purpose of holding the skier to the ski as he traversed snowy terrains.

As the practice of skiing for sport evolved, so too did the complexity of the binding. Sondre Norheim, in particular, is generally credited for giving sport skiing its initial downhill shove by inventing the very first heel binding which he designed using tree roots.⁴⁴



The Osier binding invented by Sondre Norheim. Photo courtesy of 9000 Years of Skis.

Right: Prehistoric bindings from Slovenia. Illustrations courtesy of 9000 Years of Skis.





Sondre Norheim. Photo courtesy of How to Ski.

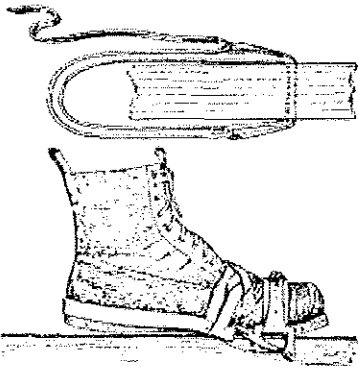
Sondre Norheim

Sondre Norheim, an early ski enthusiast from Norway and inventor of the Telemark ski, decided that in order to take full advantage of his skis, he would need to be bound to them more securely. To achieve this he took thin birch roots, soaked them in water for flexibility, then twisted them together and wrapped them around his heel.

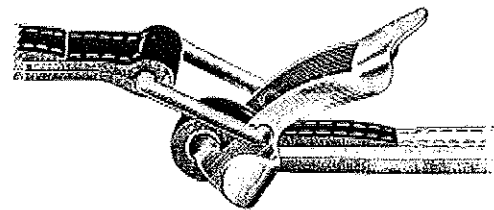
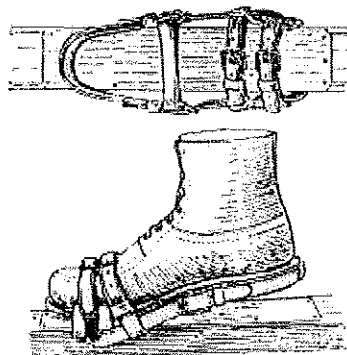
In 1850, securely bound to his ski, Norheim invented the slalom and perfected the first Telemark turn. His new binding didn't completely take off, however, until sixteen years later when the 41-year-old Norheim amazed the crowds at an 1866 ski jump competition at Hoydalsmo, near Morgedal in Telemark. Two years later Norheim's new heel binding astounded the crowds again at Christiania. Norheim's Osier binding would continue to set the style for sport skiing until the late 1890s when a series of newly patented ski bindings lead to the development of Fritz Huitfeldt's toe iron.⁴⁵

Fritz Huitfeldt

Although sport skiing in the late 1890s had already begun to attract recreational skiers, rope tows and ski lifts had yet to be invented. If skiers wanted to experience the thrill of speeding down the slopes, they were faced with a steep hike up. With these recreational skiers in mind, Huitfeldt invented a binding that left the heel free to move. Now skiers could move their heels up and down while they hiked to the tops of the slopes, yet their heels would still be bound firmly with leather straps to a rigidly anchored metal toe.⁴⁶



1894 Huitfeldt binding. "A strong simple binding. The leather parts can easily be repaired. It is adjusted by pulling the thongs; it is firm and secure and allows perfect control. The putting on and taking off takes some time. The side pieces must be of soft malleable iron, not of steel. This is the most popular binding in Norway. For use in the high Alps it is not to be recommended, because its adjustment is too troublesome." It is important for this and other binding to have a heel shaped with a groove to prevent the heel strap from slipping off.



1897 Huitfeldt binding.

All illustrations courtesy of How to Ski.

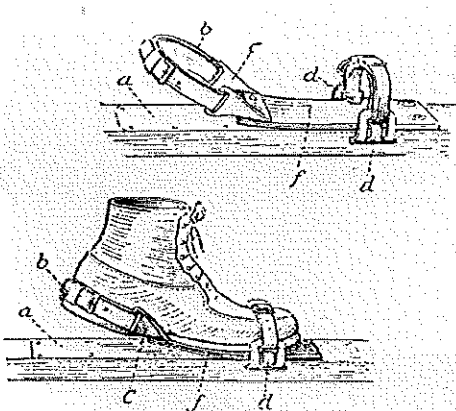
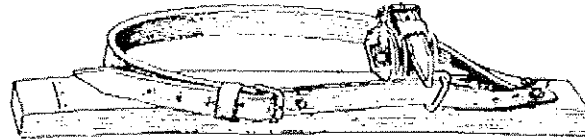
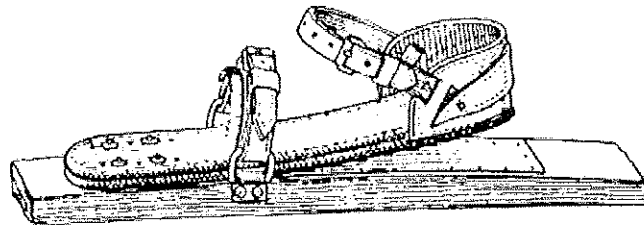


Fig. 13. The Ellefson buckle. How to Ski Ellefson Buckle:

Illustrations courtesy of How to Ski.



Schuster-Hoeck binding: "This binding is simple and durable—avoids the necessity of cutting or boring through ski, which in the opinion of many weakens the ski. The guiding control is not as good as that of Huitfeldt binding, and it is possibly not as strong."



Sole and Cap Binding: "Very much in use, especially on rented skis. Even if not well fitted it gives a certain amount of control. As it holds the heel firmly without, however, allowing the foot to turn over forward as on a hinge, it often is the cause of ankle or knee sprains."

Schneeschuhe „SKIER“
aus bestgeeigneten, astfreiem Eschenholz

Für alpine Skiläufer:
Bewährte Modelle, sowohl für Mittelgebirge als Hochalpen Bindungen, unter andern:
Sattelbinden, mit feststehendem und beweglichem Absatz, verstellbare Felle, ohne Sohle des korpulenteren Metallstabilisierens bekannte Nachteile.




Bewährte Sattelbindung mit verstellter Lederkappe u. Ringbacken-Führung (Anzeige der Lage des Schwanks in Zustellung sichtbar)
Diese neue und verbesserte Bindung „H“ in der jede Art und Größe von Schuhwerk leicht einstellbar, besonders in neuem, geradem, das Anwachslängen von Fellen, welche der europäischen Abstammung entsprechen sind, von jedem Skiläufer stark und leicht verstellbar werden können. Metall im an diese Bindung nach Möglichkeit vermieden. Gegen Schneeschuhe sowie der Felle werden Ersatzplatten mitgeliefert.

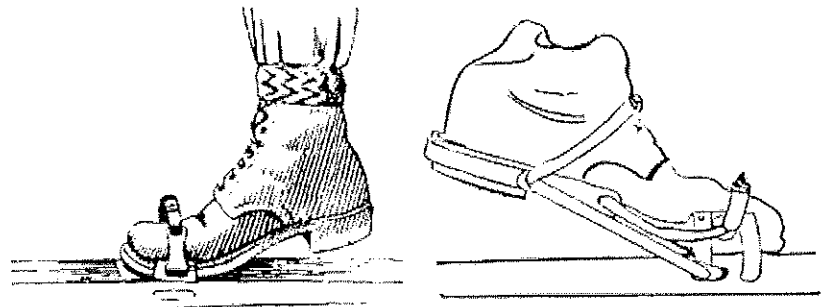
Sport-Schlitten

nach bewährten Modellen

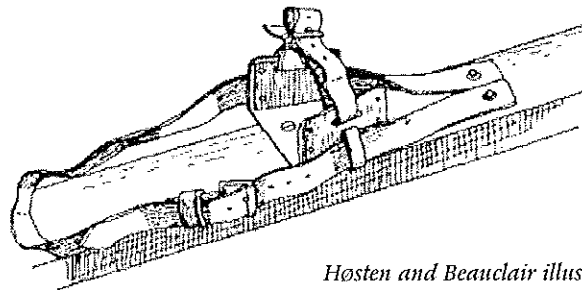
mit besten Eichenholz, in einstellbarer Ausführung, mit selbsttätiger Abbremsung

Joseph Fischer **Freiburg i. B.**
Rechen, Schneeschuhe- und Schlittensport- u. Bergsportartikel
Hauptgeschäft: 11000, Postfach 10000
Kaufmanns- u. Handwerker-Zentrum

Photo courtesy of Der Skiläufer

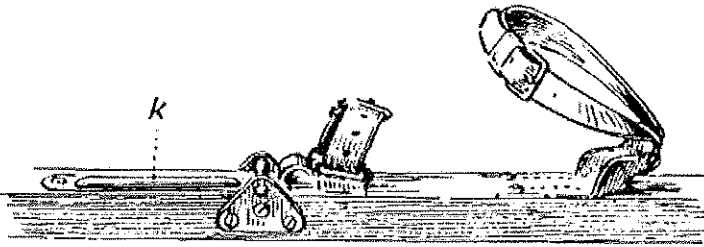


Høsten 1913 binding

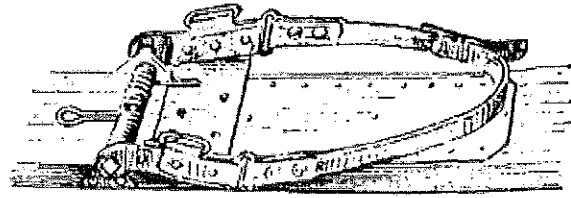


Beauclair binding

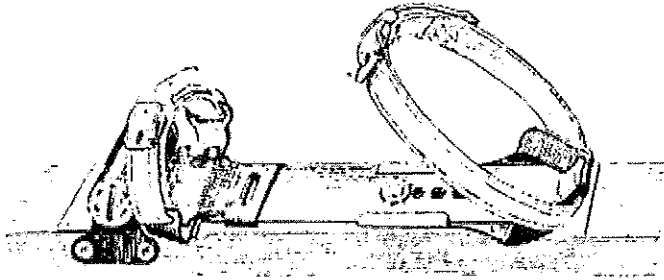
Høsten and Beauclair illustrations courtesy of Der Skiläufer



Lilienfeld Binding: "Metal binding with spring, adjustable heel and side clamps—it is expensive and heavy, but compensates for this by giving absolute control in guiding, thus making it easy for a beginner to learn the various turns in running. This binding is suitable for elderly people and also for use in very difficult country. It will always be used more for a touring ski than for sport."



Mueller binding: "Spring and clap principle combined. Must be perfectly fitted. It is very durable, but quite heavy. Good for rough Alpine work. In case the spring breaks, the side clamps can be easily unscrewed and readjusted. The Ellefsen patent snap lever buckle is very often used with this binding."



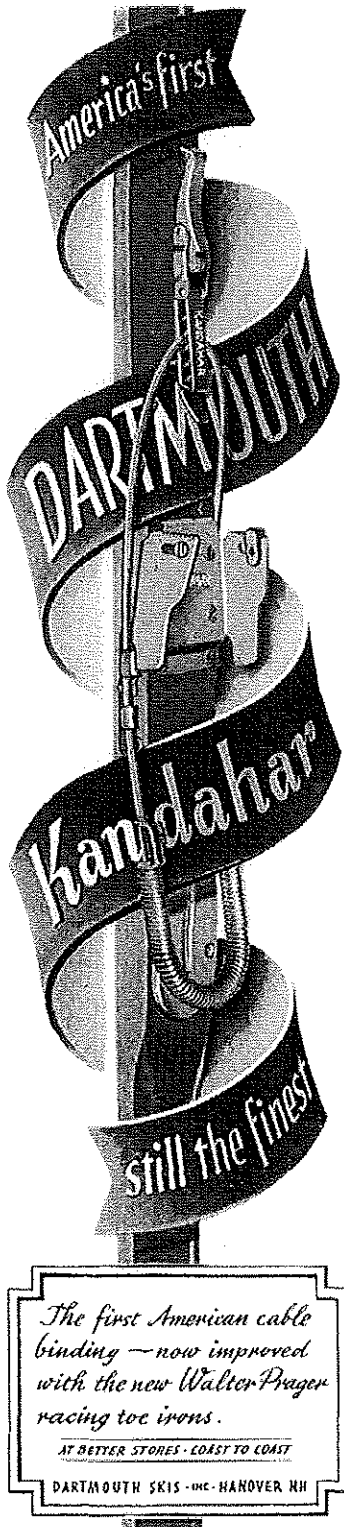
Bilgeri binding: "Bilgeri binding is similar to the Lilienfeld binding, but spring mechanism is different. It cannot injure or weaken the ski by chafing. This binding is light and well made, but perhaps not quite as strong though certainly durable enough."

Illustrations courtesy of How to Ski.



Before lifts skiers could only access the mountains on foot or sometimes by driving old mining roads in army surplus Jeeps. This group of hardy skiers is carrying their wooden skis through a snowstorm for a couple of runs. Photo courtesy of Aspen Historical Society.

Early cable binding advertisement. Photo courtesy of The American Ski Annual.



In 1897, Huitfeldt improved his patent by running toe irons through the ski itself and turning them up along the side of the ski, instead of bolting them to the sides. Combined with D'Hoyer Ellefson's patented tightening device in 1904, Huitfeldt's toe irons dominated the binding industry through the Kandahar cable era of the 1930s.⁴⁷

Cable Bindings

One of the most defining aspects of early 20th century skiing was the quest for greater speed. As ski manufacturers continued to meet the demands of speed enthusiasts with slicker, more responsive skis, it became apparent that bindings would need to be improved in order to more safely accommodate the new, faster designs.

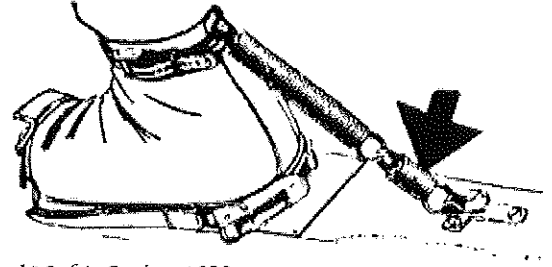
In 1905, Malsev's cable company created a design that ran a metal cable through guides along the side of the ski to draw the heel down. In 1920, Marius Ericson, designer of superior skis and edges and father of Stein Ericson, improved upon Malsev's design by adding a harness that utilized toe irons mounted to the ski. The new cable binding, or Kandahar binding as they were sometimes called after the European location, kept the foot securely bound to the ski regardless of speed. These early designs were given the nickname "beartraps." They were so effective that skiers were essentially trapped in their skis.⁴⁸

By the late 1930s cable bindings had become the most popular type of ski harness. They were stronger, lasted longer and were easier to adjust than the old leather strap binding. According to James Champion of Dartmouth's Ski Shop in Hanover, New Hampshire, the greatest asset of the cable binding was its easy and adequate adjustment for diagonal tension. This tension held the heel of the boot close to the ski, which was necessary for fast downhill running and turning. However, as the 1940 edition of *Ski Manual* contends, they were not considered fully effective without the heel spring which was part of most, but not all, cable assemblies on the market.

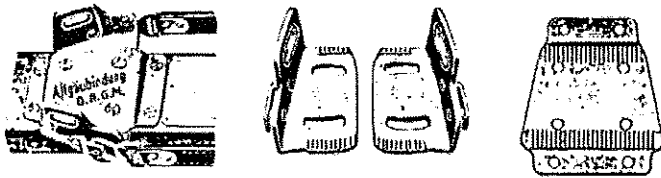
During the 1930s and 1940s, numerous firms in the United States and Europe produced cable bindings. The majority were very well made and were priced anywhere from \$5 to \$7.50 a pair. One of the most common was the Anderson & Thompson racing binding which was designed with a low toe iron and an adjustable lip to hold the boot rather than the toe strap. This model was favored by expert skiers because it adjusted quickly and held the boot more securely than the toe strap variety. The adjustable lip also prevented the boot



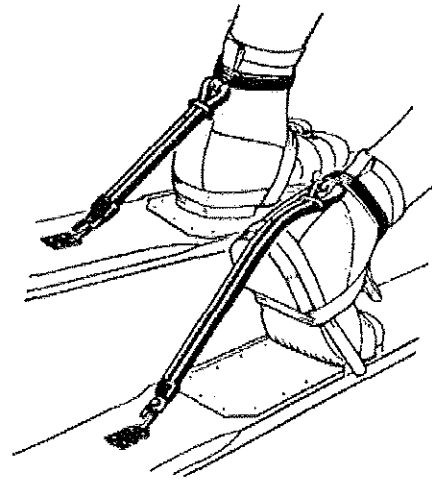
Alpina Junior, 1932



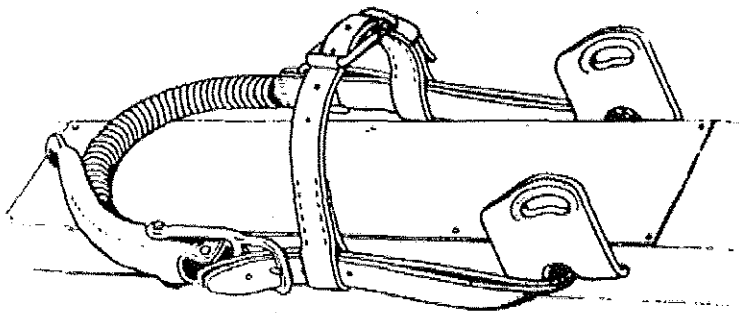
"Ingab" Safety Spring, 1932



Allgau binding, 1932

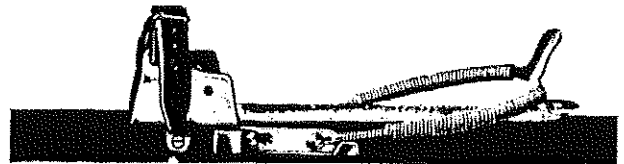


Eckel Double Rubber Heel Spring, 1932

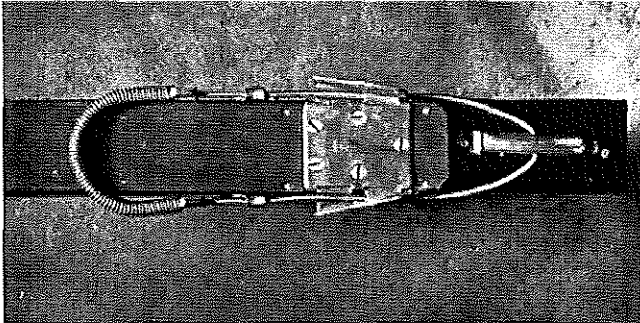


Bildstein Patent Spring Heel Strap used with a mortised toe iron and strap. Note the large lever to close the spring, 1932

All illustrations courtesy of 9000 Years of Skis.

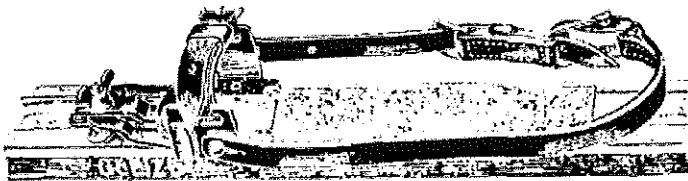


Liguria binding, 1939



The Swing binding, 1939

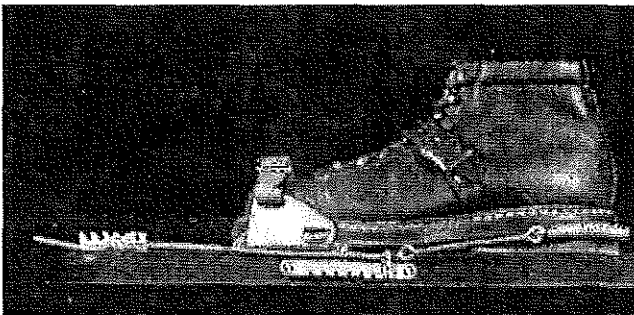
Photos and illustrations courtesy of 9000 Years of Skis.



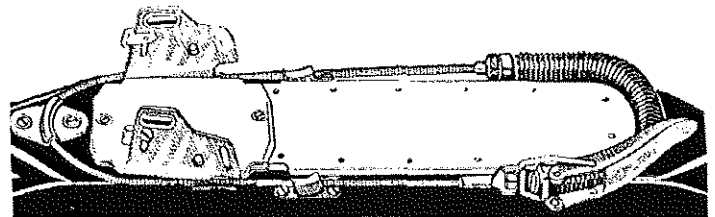
Falisse binding, 1939



The superdiagonal ankle band, 1939



Spearhead binding, 1939



Attenhofer 4-Star binding, 1937



an entirely NEW conception in Binding Design

There is nothing else that can be developed in its kind...
 The Murray Binding is the only one of its kind...
 A perfect "balance" of safety and speed...
 Murray Manufacturing Corp.
MURRAY MANUFACTURING CORP.
 1210 ATLANTIC AVENUE, BROOKLYN 14, N.Y.

Photos courtesy of 9000 Years of Skis.

toe from curling while keeping snow out from under the toe. The average skier favored rear throw, and later front throw cable bindings for their solid safety record.

By 1940, cable bindings, once considered unsafe except for experts, were universally recommended for everyone. Unfortunately, despite improvements, they were still the cause of many serious ski injuries. In 1938, following a near epidemic in ski injuries, the Ski Club of Great Britain offered a cash reward for a reliable safety release binding design.⁴⁹ The race for safety was on! It wasn't long before an injured skier would cross the finish line.

"Hvooom with HVAM"...

In 1938, Hjalmar Hvam, a prominent skier of Norwegian descent, broke his leg while trying to avoid a chunk of snow at Mount Hood, Oregon. In January of 1939, at the very same place, Hvam broke his leg again. While recovering from surgery, Hvam was inspired with a design for a new safety binding. He quickly requested pencil and paper and began sketching the preliminary drawings for what would become the revolutionary Hvam Saf-Ski binding.⁵⁰

Hvam's Saf-Ski binding elaborated on the basic spring release principal of an earlier French model that had been patented but never marketed. The pressure of the springs provided exactly the right amount of tension to keep skiers securely fastened to their skis even with the sharpest turns on the steepest slopes. Yet, if a skier lost control in a turn and fell, the ski would release from the boot therefore preventing most knee and leg injuries.⁵¹

In the midst of skeptics, Hvam introduced his new binding in his hometown of Portland Oregon. Once its advantages were demonstrated on the slopes, however, the binding caught on quickly. Soon other manufacturers were coming out with their own variations.

...and Beyond!

The first generation safety binding featured a release toe piece and a cable heel that incorporated forward release. In 1933, Adolph Attenhofer developed the first complete fixed heel all-metal binding. This binding held the heel in place with "walking" and "skiing" metal hook hold-downs. Attenhofer's new binding combined with the steel edge to accelerate technique and racing development. The fixed heel also provided for more powerful turns and better control on hard-packed snow.

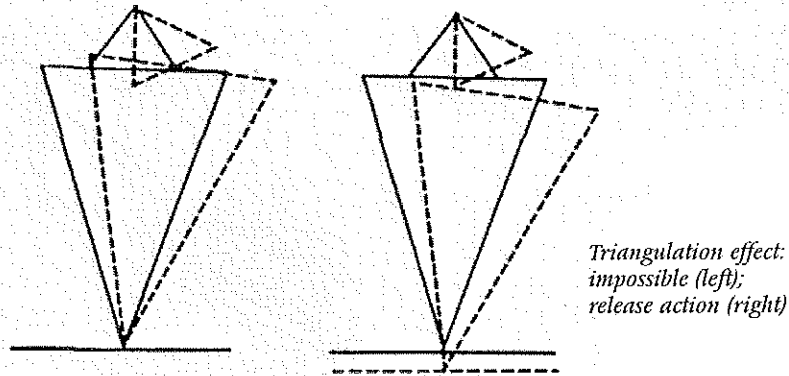


Fig. 36. Triangulation effect; impossible (left); release action (right). America's Ski Annual, 1942

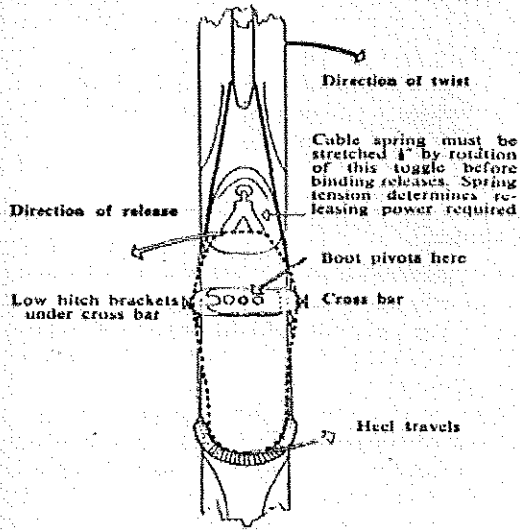
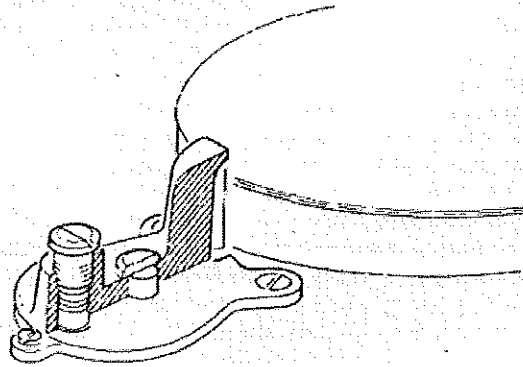


Fig. 37. Hvam Saf-ski binding. BSYB, 1952

Hvam Saf-ski binding, 1952

Fig. 38. Single point-of-contact toe release with ball and spring action. America's Ski Book



Single point-of-contact toe release with ball and spring action.

By the end of the 1940s, having proved their indisputable value, safety bindings had become almost standard. Popular safety bindings of the decade included the Kandahar Brand cable binding with micromatic toe irons, adjustable sole lugs, heel spring cables, side hitches and front throws; the Dovre cable binding with both adjustable sole lug and toe strap models; the Northland Micromatic binding with micromatic toe irons, adjustable sole lugs, two micromatic cables with heel springs, side hitches and front throws; and the Anderson & Thompson cable binding which came in both wedge toe and toe strap models each with micromatic cables with heel springs, side hitches and front throws.

Salomon Bindings

The Salomon "Lift" cable binding was for many years the world's most popular binding. The Salomon company was founded in 1947 by Francois "Peppy" Salomon. Peppy left his job as a sawmill foreman in France and invested his savings in a workshop which manufactured steel edges for skis. This shop was located at Annexe in the French Alps. Several years later Peppy Salomon and his family introduced their first metal binding, the Skade releasable toe-piece. Achieving moderate success, the company went on to develop the revolutionary "Lift" cable binding soon after. With its ease of entry and exit, the binding became an instant hit and established Peppy's small company as the leader among binding manufacturers.⁵²

Stepping In and Out

In 1950, Mitch Cubberly, a New Jersey based manufacturer, developed the first step-in safety binding, the Cubco Safety binding. The Cubco binding used safety brackets attached to the boot toe and heel that snapped into spring-loaded clips mounted on the ski. In 1955 Cubberly introduced the Guardian Angel, a heel-toe, latch-in release binding requiring metal boot plates to lock the boots into place.

At about the same time in Utah, Earl Miller introduced a step-in safety binding that also required boot plates. Cubco and Miller bindings were unique in that they both provided forward, backward and sideways release.⁵³ The Look plateless step-in binding came out a few years later, ending forever the awkward bending over that was required to attach a pair of skis.

In addition to providing convenience, these combined integrated heel-toe release bindings had the effect of dropping the ski injury rate dramatically in the late 1950s. So much so that the Miller Ski Company introduced its Hanson binding with the claim that they would award any skier five hundred dollars who would "follow us through the same falls at the same speed, using any other standard type of binding, without sustaining injuries."⁵⁴ While this claim wasn't entirely practical, it did emphasize the safety of the binding.

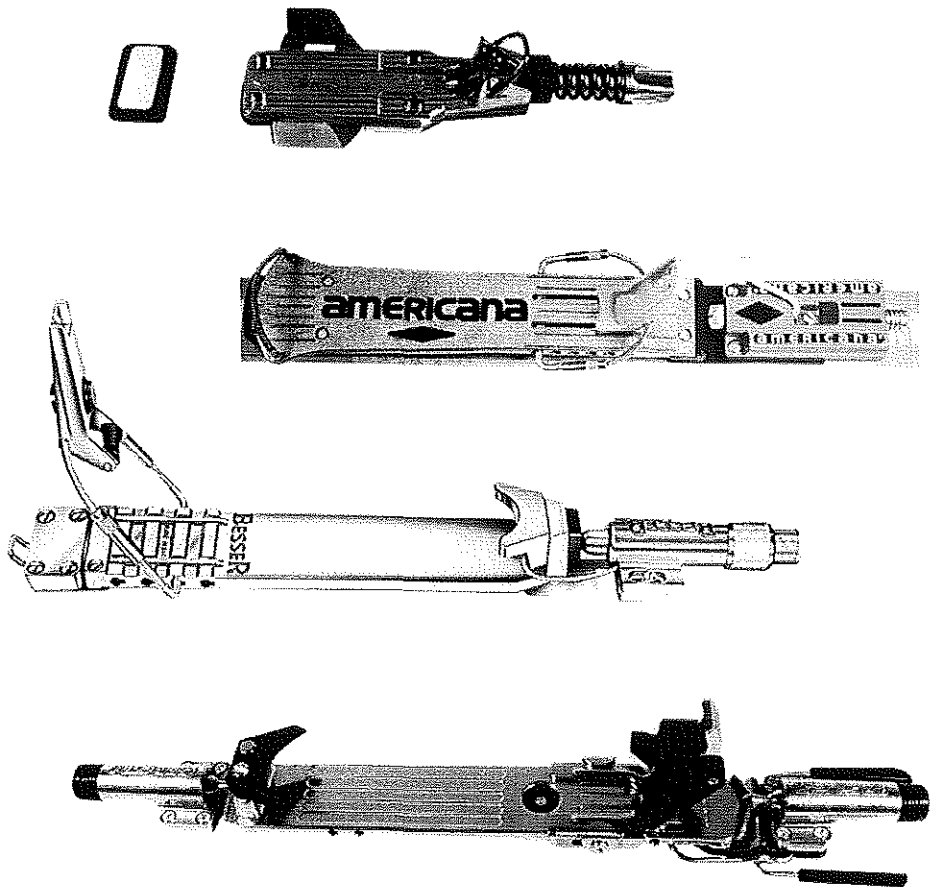


Plate bindings

Photos courtesy of 9000 Years of Skis.

Stepping Up

Binding technology developed significantly after 1960. In the mid-sixties, Marker developed the M4-15 racing binding featuring a new turntable heel that pivoted with the boot during the release, thus reducing sliding friction. In addition, the turntable utilized a short mounting base that wouldn't interfere with the ski's ability to flex.⁵⁵

During the late 1960s and early 1970s, the last years of leather boot soles, plate bindings became the cutting edge in binding technology. Among those available were Ramer Mountaineering, Cubco Elite S, Gertsch G-90, Moog, Burt, Besser Alu, Wulf, and Dr. Richard Spademan's amazing "toeless wonder"—a plate binding that released the boot from the sides rather than at the toe and heel. Nonetheless, despite the novelty of plate bindings, step-in bindings were becoming increasingly more popular, with companies like Tyrolia, Salomon, Look, Geze and Marker leading the industry.⁵⁶

Perhaps the best known of the early step-in bindings was the Marker Rotomat. One of the most innovative developments of its time, the Rotomat featured a spring release system located at the heel and set on a pedestal that rotated as the skier moved. This rotation prevented premature release.

The Rotomat, though highly praised by racers for its retention, wasn't quite as successful with the average recreational skier. Those skiers who experienced the occasional fall discovered that when the heel released, its spring assembly would break into several pieces, forcing the skier to reassemble the binding with gloved hands in deep snow. As a result the Rotomat was more commonly referred to as the Explodomat.⁵⁷

Despite the Rotomats quirks, it was a technological miracle compared to the Americana binding. Its plate binding had a steel surface that would rust and then stick together. As a result, the binding often failed to release at all, even when banged with a hammer. Plate bindings fell out of favor altogether in the late 1970s early 1980s following the advances made in plastic boot making.

Alternative Binding Systems

The development of higher-tech plastic boots inspired a whole new generation of binding technology. Breakthrough innovations included anti-friction pads, shock absorbers and alternative binding methods. The Look Integral

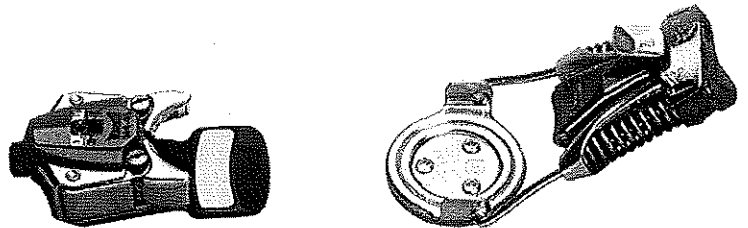
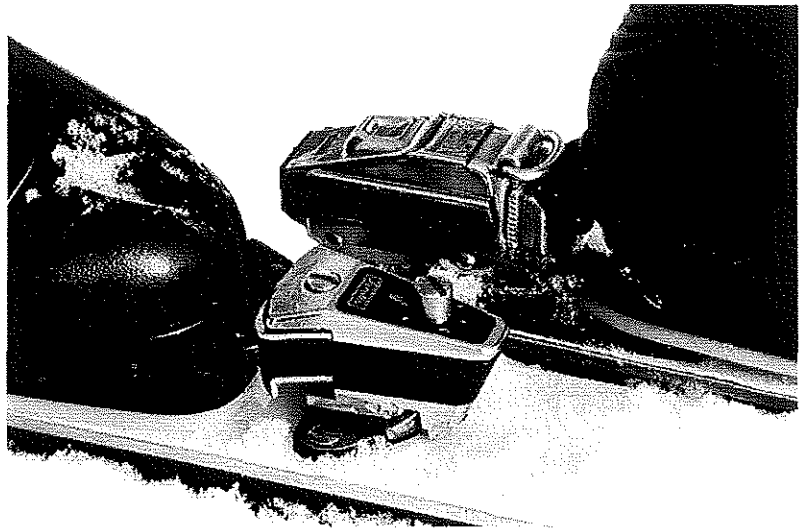
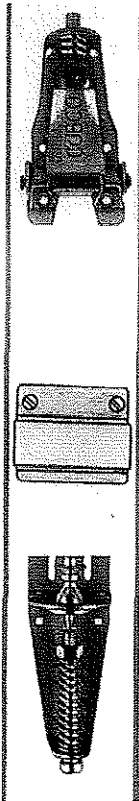
system and the Burt binding were two of the alternative binding methods that obtained brief moments of popularity.

The Integral system was unique in that it combined a specific boot with a specific binding. With the Integral, skiers were guaranteed a custom match. But a ski mounted with the Integral binding could not be used with any other boot thereby limiting the lifetime of the binding.⁵⁸

The revolutionary Burt binding, a spin-off of the plate binding, featured retractable cables that released the boot from the ski during a fall, then automatically returned the ski to the boot and latched it back into place. While these bindings seemed functional for awhile, they broke easily and constantly required attention.⁵⁹

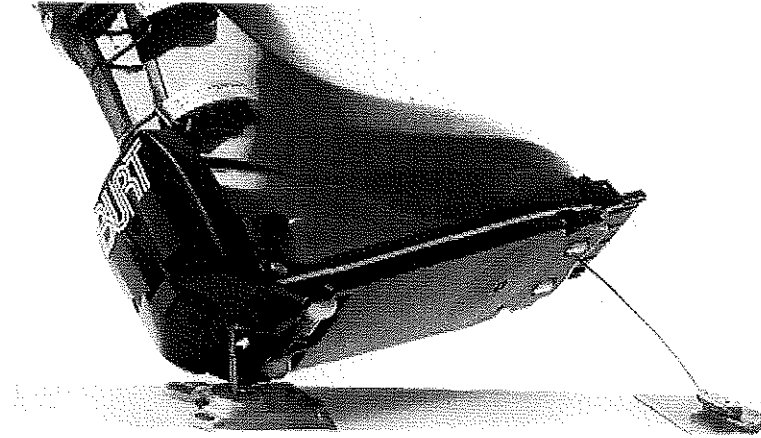


Look Integral System

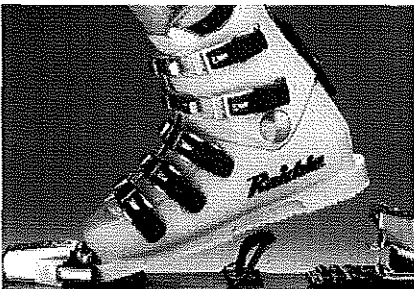


Cubco (left) and Marker bindings

Photos courtesy of 50 Years of Skiing in North America.



Burt bindings



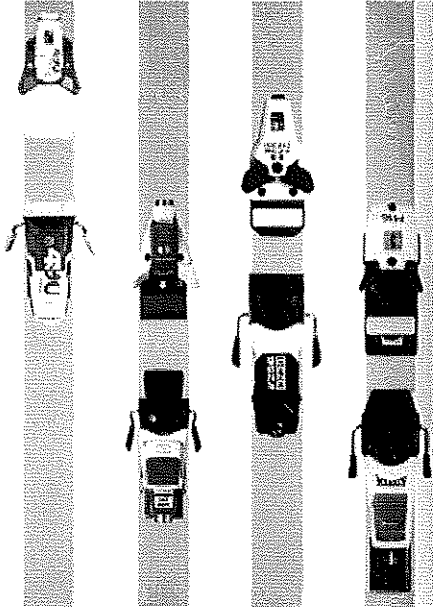
Safety breaks under the boot

Photos courtesy of 50 Years Skiing in North America.

Putting on the Brakes

The most exciting advance in binding technology during the late 1970s was the development of the ski brake. The first ski brake, or "Ski Stopper" as it was originally called, was introduced by Mitch Cubberly in the late sixties. It featured a narrow, spring-loaded steel paddle that attached to the binding just beneath the boot. If the binding released during a fall, the ski break would grab into the snow thereby preventing the ski from sliding away. Eventually the steel paddle was replaced with a more efficient double-pronged lever. Because the prongs could be used to connect a pair of skis at the base, the brake also made skis easier to carry.

As convenient as it may have been, this advancement, like many others in ski equipment history, was not an instant hit. The fact that the ski break made it no longer necessary for ski and skier to stay attached meant that skis might become detached while skiers were riding the lifts. This was a risk that few ski resort managers and lift operators were willing to take. With the development of high-elasticity bindings designed to prevent premature release, this concern was soon eliminated and ski brakes became a standard component of all modern bindings. Gone forever were longthongs and safety straps and along with them the numerous cuts and bruises associated with a released yet still attached ski.⁶⁰



Bindings after the '80s. Photo courtesy of 50 Years Skiing in North America.

Present Day Bindings

Today all bindings are exclusively of the toe-heel unit variety. All brands feature anti-friction pads at the toe of the boot sole to reduce friction between boot and ski top; integrated ski brakes; multi-directional release; and step-in/step-out, hands-off convenience. While the 1990s brought few changes in basic binding design, there were major breakthroughs in performance technology. The very latest developments include flex enhancers, lifts and damping devices designed to reduce chattering.⁶¹

Despite the great advances made in binding safety over the years, bindings are still the subject of more scrutiny than any other piece of ski equipment. Over the last few decades binding manufacturers have been the target of more lawsuits than any other sports equipment supplier. Consequently, the binding industry is not quite as lucrative as it once was. Printed warnings advising skiers to "ski at your own risk" no longer suffice. Skiers today must sign waivers whenever bindings are mounted or repaired. As a result, only a handful of binding manufacturers remain in business.⁶² Those that have endured are:

- Ess
- Marker
- Salomon
- Rossignol
- Look

Geze, previously one of the binding giants, is no longer in the lineup. The brand name was purchased by Rossignol in 1994. Rossignol also purchased the Look binding brand but continues to manufacture bindings under the Look name. Look bindings are currently distributed in the United States by Dynastar—a brand also owned by Rossignol.⁶³

Chapter IV

SKI BOOTS



WWI Soldiers. Photo courtesy of the Art of Skiing.

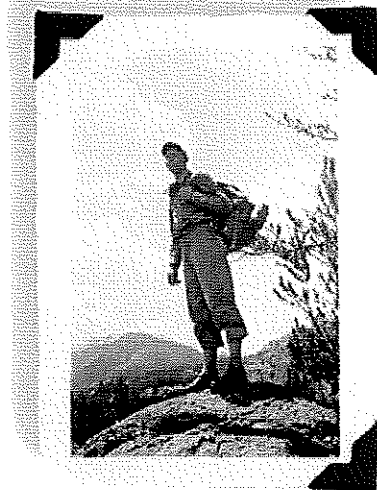


Photo courtesy Dick Dirkes.



Skiing soldiers at Camp Hale, c. 1943. Photo courtesy of Aspen Historical Society / Ryan Collection.

Today the basic function of a ski boot is to transmit a skier's leg movements directly to his skis. A century ago this was far from true. As early as the turn of the century, boots were not even considered ski equipment. Skiers wore everyday winter footwear such as shoes with gum rubber soles or standard work boots designed for farming, logging or hunting. These boots, though warm and comfortable, provided little ankle support and gave the skier absolutely no control over his skis.⁶⁴

The very first downhill ski boots were developed in the beginning of the 20th century. These were made of thick, heavy leather and closely resembled mountaineering boots. This seems appropriate as early skiers were very similar to early mountaineers.⁶⁵

During the 1930s ski boots became more commonplace, yet they remained fairly awkward. The predominant boot style was short at the ankle and boxy at the toe. While the boot was comfortable, once again the short, relatively soft ankle piece provided little protection from ankle twists. The low ankle also hindered performance by causing the boot to warp when pressure was exerted against the sides.⁶⁶



Steve Knowlton on patrol with an alpaca liner, designed to line the soldiers' overcoat for warmth against cold winter maneuvers, on his back. After the war, recreational skiers covered the army-surplus coat's unsightly seams with brightly colored or patterned brick-a-brack and wore them as handsome, and warm, ski coats. Photo courtesy of Aspen Historical Society / Knowlton Collection.

As skiing became more aggressive in response to fixed heel bindings and better edge technology, soft leather boots literally buckled under the pressure. To remedy the problem, steel shanks were installed in the leather sole to counteract the buckling effect. In addition, boots were secured with six-foot long straps of leather called Longthongs. The primary purpose of the longthong was to provide added rigidity across the front of the boot while insuring that the skier remained connected to his skis.⁶⁷ By 1938, ski boots had become stiffer but longthongs were still used to increase ankle support.

Following the success of laminated skis in the late 1930s, it became apparent that boot technology was in desperate need of advancement. Unfortunately, further developments were temporarily put on hold while manufacturers and skiers alike turned their attention to the war effort. Ironically, though World War II brought ski technology to a standstill, it also produced new resources that would forever change the nature of the sport.⁶⁸

Technology from the Frontline

During the war, thousands of GI's trained with the United States Army's 10th Mountain Division at Camp Hale, Colorado. United by their common bond of skiing, these men went on to become one of the most determined outfits in the United States Military— a quality that endured despite the fact that the 10th suffered one of the war's heaviest casualty rates among American divisions. (Thirty percent of its men were killed or wounded in the breakthrough from Italy's Appennines to the Brenner Pass in 1945.)⁶⁹

After the war those men who survived returned home to exhibit the ski techniques they had learned while training. Many of these soldiers became ski instructors, teaching cutting-edge technique to thousands of beginning skiers. Others, inspired by the possibilities of the growing ski industry, became inventors, developers and entrepreneurs. In all, some 62 resorts were either founded by, directed by or had ski schools run by 10th Mountain Veterans; two thousand of them had gone into the ranks of ski instructors.⁷⁰

Along with new ideas and techniques, the 10th Mountain Division also brought an abundant surplus of state-of-the-art military ski equipment. The war had barely ended before ski newcomers, eager to try the sport that had previously been reserved for the rich, began snatching up the surplused two-dollar-a-pair ski boots and hitting the slopes in droves. Following a brief hibernation during the war years, skiing had returned with a bang.

NORDICA
SKI BOOTS

THE AOSTA
The Standard
The All Season
\$32.95

THE ZENO COLD OLYMPIC
Cold Guard
\$30.95

THE ALPINE
The All Season
\$32.95

THE ALPINE
The All Season
\$32.95

GUARANTEED HAND-MADE
By Nordic Master Craftsmen

BECONTA

HAND MADE

THE MONT TREMBLANT
CANADA'S OUTSTANDING SKI BOOT

10 Distinctive Features

- Hand Stitches With - 20 Strands Thread
- Each Stitch Individually Locked
- Natural Hoof For snug Fit
- Buck Lacing to Ensure Fit
- Three Widths for Men
- Special Warm Resistant Interlining
- Full Leather Lining
- Elastic Lippers Sewn with Nylon Thread
- Sponge Rubber Custom Turned
- Two Widths for Women

Early advertisement for leather ski boots. Photo courtesy of Ski Magazine.



Photo courtesy of Aspen Historical Society.

Ski equipment, itself, changed very little in the years immediately following the war. Because of its high quality and abundance, Army surplus ski equipment more than adequately fulfilled the needs of ski enthusiasts. Living in the midst of the inventive post-war industrial era, however, it was only a matter of time before skiers began demanding something better.

Post-war Boots

The development of new synthetic materials during the war played a key role in the advancement of post-war ski equipment technology. Armed with a greater understanding of aluminum, fiberglass and plastics, airplane and weapons engineers like Howard Head left the war factories and began to focus their attention on the growing ski industry. The skis they produced were sleeker, more durable and could out-perform anything ever before manufactured. The only thing that hindered their efficiency was the lack of an adequate boot. Breakthrough developments in ski technology necessitated the need for a boot that could perform under the most strenuous conditions. This ultimately led to the use of synthetic materials in ski boot design.⁷¹

The conversion from natural materials to synthetics in ski boot construction was a slow going process. Boot manufacturers, working with nothing but leather for decades, were hesitant to make any outrageous structural changes. As a result synthetics were first introduced as accessories for previously existing leather boot designs rather than replacement materials.

For example, in 1949 the Tyrol Company of Montreal, Canada introduced the Tenderfoot Anklet made entirely of porous rubber. This boot insert was designed to support the ankle while providing a more comfortable fit. In 1950, nylon was introduced in the form of boot laces. These laces were extremely durable and didn't retain as much moisture as cotton. Unfortunately, lacing them up was still tedious and time consuming, especially if the boot had a laced inner lining.

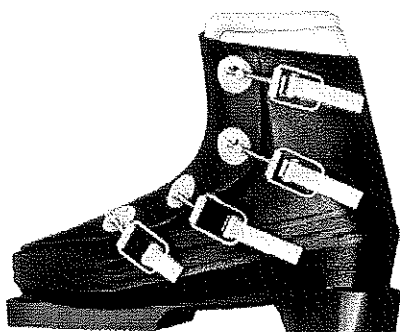
In 1955, Henke, a Swiss boot manufacturer, attempted to solve this problem by introducing the Speed Fit, the world's first buckle boot. Hailed as the most innovative invention of its day, the Speed Fit was designed with four metal hooks that closed easily and could be adjusted with just the right amount of tension to hold the skiers foot secure. Despite its obvious advantages, the boot proved to have one unfortunate flaw—in time the force exerted by the



The Henke Speed Fit was the world's first buckle boot, 1955.



The first Lang designed by Bob Lange in 1957.



The Lady Lang or "Competite," as it was officially named, was the first plastic womens boot, c. 1963.

buckles tended to deform both the leather of the outer boot and the skiers foot inside!⁷²

In response to advances in ski equipment technology following World War II, leather boots became increasingly stiffer, yet they remained problematic. No matter how stiff or superior in design, leather boots still broke down and stretched out over time. Some leather ski boots could stretch as much as two sizes on a wet day. The strain on the ankles was unimaginable. In 1957, Robert Lange, a weak-ankled Harvard graduate who was personally familiar with the inefficiencies of the leather ski boot, would solve the problem once and for all.

Les Plastiques Fantistiques"

Robert Lange's obsession with designing a plastic ski boot came from his own difficulties learning how to ski. As a beginner, it had taken Lange an entire season to progress to the basic stem turn.⁷³ Having become frustrated with the lack of ankle support offered by standard leather boots, Lange, who had a plastics fabrications firm in Dubuque, experimented with designs for a plastic ski boot. While Lange knew that forward flex was important in a ski boot, he believed that the boot should also be "laterally rigid and high enough to permit the lower leg, rather than the ankle, to edge the ski"⁷⁴

In 1958, after months of experimentation, Lange patented his first boot made almost entirely of vacuum-molded ABS Royalite plastic. Yet, although the design itself was far superior and the boot consistently held its shape, it was so stiff that it took two men to lace it. To complicate things even more, ABS plastic proved to be too brittle. Of the 750 pairs of boots produced that first year, more than fifty percent cracked when exposed to prolonged cold.

The following year, Lange added a hinge to the boot for increased forward flex and switched to Adiprene polyester, a lighter more pliable plastic that was just as durable. In 1963, he added buckles similar to those used in the Henke Speed Fit. The result was a boot that could be closed with relative ease against a sturdy foundation of plastic engineered to resist deformation. This design was a success. Within ten years, millions of skiers would ski in Lange boots.⁷⁵

"The Era of the Boot"



Rear entry boots. Photo courtesy of 50 Years of Skiing in North America.

By 1969, in the wake of Robert Lange's success, nearly every boot company had introduced a version of the plastic ski boot. Lange and Rosemounts led the industry with their all-plastic, high-cuff buckle boots that securely anchored the foot and ankle. Rosemounts took the design one step further by including small bags of material that could be packed around the foot to provide a custom fit.

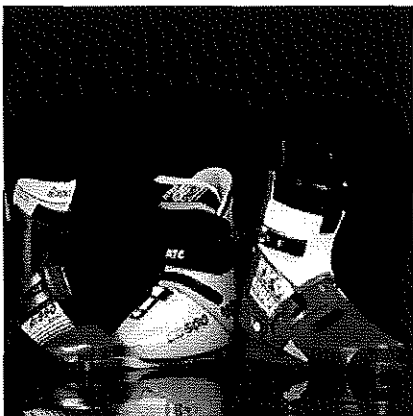
Later innovations included boots that featured taller ankles and exaggerated forward slants. This design forced the knees forward, lowered the hips and permitted more knee leverage to be transmitted to the skis.

By 1970 boot tops grew even taller to support the French "sitting back" technique which had gained immense popularity in America. (This trend would continue on into the eighties, when it was finally agreed upon that the high boot tops were the cause of most knee injuries.) By the end of the 1970's, boot technology had finally grown sophisticated enough to fully complement the new generation of fiberglass skis.⁷⁶

Having perfected the basic style of the ski boot, manufacturers began turning their attention towards customizing technology. The late seventies and early eighties characterized a period of rampant experimentation in ski boot design. Some developments, like the rear-entry boot, were incredibly successful. Others, like the knee-high boot, failed miserably. While the new designs sported all kinds of fancy gadgets such as precision adjusting levers in the heel and toe, and built in heaters, they continued to follow the basic forward slant design perfected in the 1970s.⁷⁷

Custom Foaming

Custom foaming was a process in which a skier's foot was sealed into an inner boot through an injection of polyurethane foam. While custom foaming was popular with skiers, it was a constant nightmare for ski shop technicians who found the process messy, complicated and costly since any boot foamed improperly had to be thrown away. Two years after its introduction, the process was abandoned in favor of more economical inserts.



Late '80s, early '90s. boots. Photo courtesy of 50 Years of Skiing in North America.

Present Day Boots

Today's boots are still designed to provide support and rigidity to the foot while enabling the skier's leg movements to be transmitted to the ski. Contemporary boots are made of high tech, relatively stiff plastic. The shell consists of two main pieces of plastic that are hinged together dividing the upper and lower portion of the boot. The boot sole and the lower boot are formed at the same time. The sole is stiff and flat at the bottom with a thickness specifically designed to accommodate the binding. The upper boot may have a Velcro powerstrap for additional support.

The inner boot is the lining underneath the shell. The lining is made of a pliable, cushioning material that provides insulation and added fit. This material can be a gel or synthetic that molds itself to the foot over extended use or it can be a material that, when heated, provides an instantaneous custom fit.

Some boots have additional features designed to aid adjustment. A cant adjuster allows the skier to change the stance of the boot by changing the angle of the cuff. A forward flex adjuster lets the skier vary the fore-aft stiffness of the boot depending upon ski conditions. To accommodate the new generation of supersidecut skis, experts recommend boots that have a relatively soft lateral flex.⁷⁸

There are three basic boot types: rear entry boots, overlap boots and mid-entry boots, also called central entry. Rear entry boots are the least expensive. They are taken on and off by unbuckling a flap at the back of the boot just above the heel. During the 1980s rear entry boots were extremely popular among recreational skiers because they were so easy to take on and off. However, despite their convenience, rear entry boots failed to perform to the higher standards of expert skiers and ski racers. Their popularity declined sharply during the 1990s.⁷⁹

After years of experimenting with different boot designs, the current consensus of the ski industry is that combining high-tech materials with a "time-tested multi-buckle design" creates the best-performing boot. Overlap boots provide a great range of both price and performance quality. This overlap design takes its name from the manner in which a wide side flap is pulled over and attached to the front of the boot. The top of the boot reaches way above the ankle and is closed with four buckles over a thick padded tongue. Of all the three prevailing boot styles, the overlap is considered the most versatile and the one that best performs.⁸⁰

Mid-entry boots, also referred to as central entry, were designed to combine the convenience of rear entry boots with the comfort and versatility of the overlap boot. Their primary feature is a wide-opening cuff that opens to the back and front. While they are efficient, well performing boots, they have not quite achieved the status of the overlap boot. Therefore, there are not as many mid-entry boots on the market.⁸¹

The following are the boot manufacturers whose products currently dominate the ski boot market:

- Alpina
- Dachstein
- Dalbello
- Dolomite
- Dynafit
- Koflach
- Lange
- Lowa
- Munari
- Nordica
- Raichle
- Rossignol
- Salomon
- Sanmarco
- Technica

More than fifty percent of these boots are manufactured in Montebelluna, Italy—a small town, not far from Venice.⁸²

Chapter V

SKI POLES

For centuries skiers carried one single heavy wooden pole. This was used for pushing, for balance and, when straddled between the legs, for breaking. At one time it was thought that two poles hindered a skier's downhill momentum. During the early 1900s it became fashionable to ski with two poles. By 1939, thanks to the technique made popular by Mathias Zdarsky, it became common knowledge that, not only was it fashionable to have two poles, it was absolutely necessary in order to ski properly.

For decades, these poles were made of bamboo which varied in length according to the various techniques of the day. Early bamboo poles were equipped with large, floppy baskets usually made of woven leather.

In 1938, due to unprotected cane's tendency to split, the trend shifted towards coated cane poles. Some new types to emerge included a shaft of cane which was protected by a color coated fiber husk. Most of these were made in Europe such as the Austrian Ingab. However, a pole of this same type called the GB Texoid shaft was manufactured in the United States.

Some manufacturers utilized a process of dipping the cane in a plastic type paint. This was called Duraloid. The dipped canes were more economical



Aspen ladies take to the slopes for beginner ski lessons in 1937 sporting bamboo ski poles. From top to bottom are Edwina Kelleher, Peggy Sheenan, ?, Francis Willoughby Herron and Doris Sheenan Willoughby. Photo courtesy of Aspen Historical Society.



All these members of Spritly Tightly Ski School have switched from bamboo to metal poles, except the little girl. From left to right: DRC Brown, Bob Perry, Florian Hammerlae, Dave Quiny, Leonard McLean, Jerry Hiatt, Steve Knowlton, Barney McLean, Miggs Durrance and Mary Litchfield. Photo courtesy of Aspen Historical Society / Dick Durrance collection.

but not as durable as the fiber coverings. Metal shafted poles were also becoming increasingly popular following their advent in 1937.

By 1940 there were a great many types of poles on the market ranging from the ordinary cane pole at about two dollars a pair to the latest steel shaft poles at about six dollars and fifty cents a pair. Every pole had a leather wrist strap properly designed for the correct hand grip.

Otto Lang's Poles of Steel

Otto Lang first came to the United States in 1935 as a ski instructor fresh from Hannes Schnieder's Arlberg School in St. Anton, Austria. After instructing for a short time with Sid Buchmayr at Peckett's on Sugar Hill, New Hampshire, Lang decided to head west to Mt. Ranier where he established his own official Arlberg ski school at the Paradise Lodge.

Being an entrepreneur, he soon began to work with ski manufacturing corporations in an effort to establish his name. After designing his first successful ski for Anderson and Thompson, the early ski equipment firm in Seattle, Lang suggested that A&T sell a steel pole designed to his specifications.

Having grown frustrated with splintering bamboo poles Lang became inspired by a set of True Temper golf clubs with stepped steel shafts. After bending and manipulating the steel golf club shaft Lang was convinced that the steel material would make the ideal ski pole.

When A&T gave its approval, Lang went to the golf shaft makers, American Fork and Hoe in Cleveland, and contracted with them to make the shaft with a special curved tip. The prototype succeeded in meeting Lang's expectations. It was incredibly strong yet remained flexible when pressure was exerted upon it.

Wendell Trospen, a Mt. Ranier climbing guide who worked for A&T, was given the responsibility of individually assembling the shaft, grip and basket on every Lang pole sold. Unfortunately, A&T's experimental product budget was limited and they were unable to properly market the new design. As a result, sales were slow.

Following the outbreak of World War II in Europe, American Fork and Hoe acknowledged the great demand for steel and responded by converting their factories into war production facilities. This put a halt to A&T's production of the Lang pole.

Following the war, Lang returned to Sun Valley to head the ski school. He spent his summers learning to direct Hollywood films with the legendary Darryl F. Zanuck. Between his two busy careers, Lang had little time to pursue any further interest in equipment design. Other metal poles were developed after the war but A&T never revived the Lang Pole. Nonetheless, Otto Lang had made his mark on ski equipment history. According to the currently available historical record, his pioneer steel ski pole, introduced in 1937, was the very first of its kind.

Metal Madness

Despite its weight, by 1950, steel poles had become the industry standard. Not only had metal completely replaced bamboo, it was considered the only material truly strong enough to produce a good pole. "The Norse House Guide" 1951-52 Winter edition describes the ideal ski pole:



Hay Poschman and Dick Sabbatini display their form and their metal ski poles on Little Nell, c. 1952. Photo courtesy of the Aspen Historical Society / Rinquist Collection.

"Ski poles should be sturdy but light. The material which fills both these requirements best is hollow steel. Aluminum, though not as resilient as steel, stands up a lot better than bamboo which cracks and splinters in quick temperature changes. Pole shafts ought to be of tapered design, narrowing towards the rings; this is important for the sake of correct balance, since ski poles are used less and less for propulsion uphill and cross-country, and more and more only for aiding balance downhill. Watch that the snow rings are of light metal with oiled leather lacings solidly attached to the rim; that pole grips are of genuine rubber, or of strong, pliable leather sewn tightly around the shaft with tough twine; that the wrist sling consists of a reversed leather loop widening to a minimum of 7/8 of an inch at the wrist, with a total circumference of 15 inches."

Of the steel shafted poles, the European made Tangval pole was the most popular. Several American manufacturers designed poles that matched the Tangval's properties. One of these was the GB steel shafted pole which featured the new Flexo-Ring. Prior to this, all ski pole basket rings had been made of rattan or light metal laced with leather. The Flexo-ring was the first rubber basket ring to be manufactured in the United States. Rubber rings had considerable advantages over rattan and were also made available in lower priced poles.

Aluminum, though widely available and considered a step up above bamboo, was thought to be of a secondary quality compared to steel. This would change in 1959 when Ed Scott of Sun Valley introduced his revolutionary aluminum alloy poles. Scott's poles were lighter and had a much better balance than either bamboo or metal. Since then, lightweight metal poles, utilizing material from the war era to the space age, have become the industry standard.

Present Day Ski Poles

Skiers today have two main options when it comes to poles. Those who are in the market for something sturdy yet cost effective will find aluminum appealing. Those who want maximum weight reduction prefer graphite, carbon/graphite or poles made of composite materials such as Kevlar. Composite poles are sleek, sophisticated and offer ideal performance. The downside to the extreme lightweight materials is their susceptibility to breakage.⁸³

Along with breakthroughs in materials, refinements have also been made in pole shaft design. These include curved shapes for the aerodynamic and swingweight efficiency commonly sought after by racers, built-in shock-absorbers for mogul skiers who make aggressive pole plants, and adjustable poles which can be shortened or lengthened depending upon the changing needs of the skier.⁸⁴

The companies currently manufacturing ski poles in the United States include the following:

- Allsop
- Atomic
- Goode
- Ice
- Kerma
- Leki
- Life-Link
- Reflex
- Scott
- Smith
- Swix
- Tomic



1984 Olympic gold medallist and winner of America's downhill in Aspen, Billy Johnson displays his winning form on the set up turn for Aztec, the steepest part of the course. Johnson uses the new form-fitting downhill pole, designed to cut down on wind resistance. Photo courtesy of Aspen Historical Society.

Chapter VI

CLOTHING

When discussing ski equipment, it is important not to forget clothing. Ski clothing manufacturers take into consideration two very important factors when designing ski wear—fashion and function. Skiers not only need to keep warm while they ski, they need to look good doing it. In the last few decades, ski clothing has become arguably more important than skis. This, however, hasn't always been the case. Clothing designed specifically for skiing has only existed for about 50 years. Prior to 1936, the term "ski clothing" never entered the skiers vocabulary. Those few who were brave enough to step into a pair of skis would wear just about anything to keep the winter out. In most cases this meant clothing that was suitable for outdoor use, though not specifically designed for skisport. For example, the Sierra ski racers of a century ago favored standard workshirts and high ankle work boots covered with gaiters. Ski pants were no different than those worn everyday. In some photos the Sierra racers even appear to be wearing the original model levis, a trend that would resurface again in the 1960s⁸⁵.



Three jumpers atop Holmenkollen jump in 1906. The equipment is the latest, including reed bindings. Photo courtesy of Come Ski with Me.



This early skier sports a cap and tie, a look that was popular among early East Coast skiers. Photo courtesy of The Art of Skiing.



Norwegian skiers wearing clothing designed for hunting and outdoor recreation. Photo courtesy of Come Ski with Me.



The Dartmouth Ski Team is dressed in typical attire for the late 1930s including knickers, argyle socks, coat and tie. Photo courtesy of Aspen Historical Society.



This group of well-dressed skiers is in Jackson Hole, Wyoming for a ski race. Competing for the Aspen Senior Ski Team are Steve Knowlton, Deveraux Jennings and Bud Phillips, also attending are Shirley Fopp, Martin Fopp and Gini Heidekuper. Photo courtesy of Aspen Historical Society.

Between the days of the goldrush and the late 1920s, typical ski attire advanced to more traditional outdoor clothing. This included woolen hunting clothes which were unquestionably warm but tended to restrict movement, knickers and riding breeches which provided a bit more freedom, and baggy pants that tucked into socks but made wild flapping noises as the skier went down the slopes.

Womens' Ski Fashion

Early ski fashion for women was far more confined. Due to societal expectations of female conduct, women were limited in what they could wear. Long woolen skirts were mandatory as late as the first decade of the century. While the heavy skirts may have been considered modest, they were certainly not functional. Numerous newspaper accounts testify that women often lost ski races as a result of the drag created by their skirts.⁸⁶



Women were expected to maintain a modest form of dress. Skirts, though awkward on the slopes, were mandatory. Photo courtesy of The Art of Skiing.



Photo courtesy of The Art of Skiing.



Tired of being confined, women began wearing knidkers in the late 1920s. Photo courtesy of 50 Years of Skiing in North America.



As sport skiing grew in popularity, magazines began focusing on skiwear fashions. Photo courtesy of The Art of Skiing.

Tired of their inability to ski in comfort, women began to challenge the standards imposed upon them by society. By the late 1920's they had tossed their skirts aside for good and replaced them with the knickers long worn by men. Not only did this change provide them with more freedom, it also offered them a touch of style. From the mid-1930s on, style would become a standard aspect of all men's and women's ski fashions.

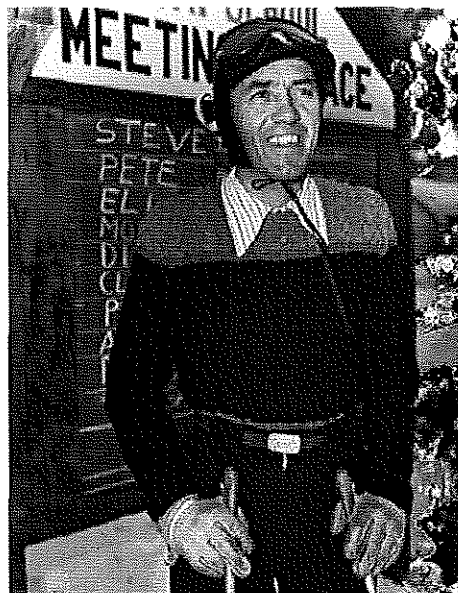
The Birth of an Industry

By the early 1930s the first clothing designed specifically for skiing was introduced. Popular items included woolen caps, Norwegian reindeer sweaters, short military style gabardine jackets, tweed wool knickers and baggy gabardine trousers worn with a belt and a tucked-in sweater. Parkas were also popular. Some were little more than waterproof shells while others were elaborate double-breasted V-necks lined with bearskin. Most of these items were manufactured in Europe where both skiing and ski clothing were considerably more established. In fact, during the first half of the 1930s only three firms—Slalom Skiwear, Sun Valley Ski Clothing Company and White Stag—manufactured ski clothing in the United States. Of these three, Slalom was the very first.



Fred Iselin with a classy ensemble featuring belted wool pants and a trim sweater.

Photos courtesy of the Aspen Historical Society.



Friedl Pfeifer at the Aspen Ski School meeting place in popular attire of the day.



Georgette Thiollière Miller wearing a parka belted at the waist to prevent flapping.

SLALOM

The history of Slalom skiwear dates back to the 1920s when Newport, Vermont was a major link in the railroad network. Benjamin Franklin Moore, of B.F. Moore Manufacturing, initially founded his company to manufacture overalls for railroad workers. In the late 1920s, seeking a new market, B.F. Moore expanded its production capabilities to accommodate the manufacture of ski clothing. Given the fledgling status of skiing in the northeast at the time, this was considered a great risk. Manufacturing under the name "Slalom," the company managed to endure over the next twenty years but did not grow large.

In 1968, the small company was purchased by Profile Ski Wear. Three years later it was sold to three partners, one of whom was the great-nephew of Benjamin Moore. The name of the company was changed to Slalom Ski Wear Incorporated and new lines of outdoor sports clothing were added. Under this ownership Slalom Ski Wear became a great success.⁸⁷



WWII Slalom Ski Wear advertisements featuring a skier wearing a wool knit sweater and baggy gabardine pants. Photo courtesy of Ski Magazine.



Slalom styles of the 1950s have gone from baggy to "sleek." Photo courtesy of Ski Magazine.



Photo courtesy of Ski Magazine.



1932 Outfits by Schiaparelli. Photo courtesy of Aspen Historical Society.

WHITE STAG

Like Slalom Skiwear, White Stag's roots can also be traced to an industry other than skiing. The company began as the Willamette Tent and Awning Company, located in Portland, Oregon. In its first years of production, the company manufactured sails for deep water sailing ships as well as hatch covers, deck awnings and sea bags. The company eventually changed its name to Hirsch-Weiss Canvas Products, after the founders, and expanded production to include items for loggers, mill workers and stockmen. Hirsch-Weiss's first clothing item was a rugged, stiff rain suit made from sailcloth that had been dipped in paraffin. Soon after, the company began producing other items such as mackinaws, gloves and saddlebags.⁸⁸

In 1929, Harold S. Hirsch, son of the founder and member of the Dartmouth ski team, was granted permission from his father to develop a new line of clothing designed exclusively for skiers. He adopted the name White-Stag after an inverted English translation of the original company name, Weiss meaning white in German and Hirsch meaning a male deer.

At this time, ski clothing was still essentially unheard of in the United States, and skiing itself was something that most Americans had never tried. Still, Harold Hirsch was convinced that skiing as a sport would eventually take off and skiers would need something more functional than standard outdoor gear.

He designed his first outfit, a one piece jumping suit, for the Dartmouth Ski Club. Soon he began marketing his line to ski shops and department stores around the nation. The business grew steadily and by the outbreak of World War II, White Stag was selling ski pants made of wool gabardine, whipcord, and whiptex, as well as poplin jackets, wool sweaters and animal fur jackets. During the late 1940s, in order to operate twelve full months out of the year, the company expanded its line to include clothing for all seasons.⁸⁹

In Search of a Style

Originally, ski clothing manufacturers produced styles that tended to be baggy for comfort and movement and woolen for warmth. According to one observer, "the ski pants looked like voluminous, elongated balloons drooping down past the knee."⁹⁰



*Examples of ski fashion from 1950s Aspen.
Photos courtesy of Aspen Historical
Society.*





Raccoon Coats were stylish in the '50s.
Photo courtesy of Aspen Historical Society.



Bea Van Cleve wears her fashionable ski pants as she traverses Wagner Park (Wheeler Opera House in background), probably on her way to Lift-1. Photo courtesy of Aspen Historical Society.

Responding to frequent demands for a trimmer look, the Sun Valley Ski Clothing Company, founded in 1938 by Lew Russfield, introduced a pair of ski pants that sported a tapered, non-baggy look. Considered far more sexy than the baggy gabardines, Sun Valley's ski pants became an instant hit. The term "non-baggy," however, didn't exactly indicate a tight fit since the pants still had to be cut large enough to allow for maximum movement.

more
ski fun with
"Slope-Master"

At last... the perfect pair of the pants! Not only are Jantzen "Slope-Master" ski pants smart looking but it's smart to own them too in helping... quality materials and exclusive patented "Grip-Fly" fasteners... snow shield to keep you in, snow out... heel hold to insure safe, firm-socking pants... elastic straps to hold side pleats firm. "Slope-Master" pants will make your skiing more comfortable... more fun.

Model "Slope-Master" ski pants are cut from heavy 18 oz. of merino wool gabardine all over with wadded padding throughout. Features:
Size: 28-34
Waist: 28-30-32-34
Length: 32-34
Retail: \$44

SELF-FABRIC SNOW SHIELD
SELF-FABRIC HEMI HOLD
ELASTIC STRAP

Jantzen
SKI CLOTHES

JANTZEN KNITTING MILLS INC. PORTLAND 14, OREGON

Jantzen ad photo courtesy of Ski Magazine.

It was apparent that some type of stretch fabric was needed in order to meet the demands of both fashion and function. Harold Hirsh, founder of White Stag, experimented with a Swiss material that combined wool and Latex, but found that it couldn't be dry cleaned. Lew Russfield of Sun Valley tried a French material composed of elastic. His material couldn't be ironed. Frustrated, both designers gave up and waited for someone else to find the solution. They didn't wait long.

BOGNER Skiwear

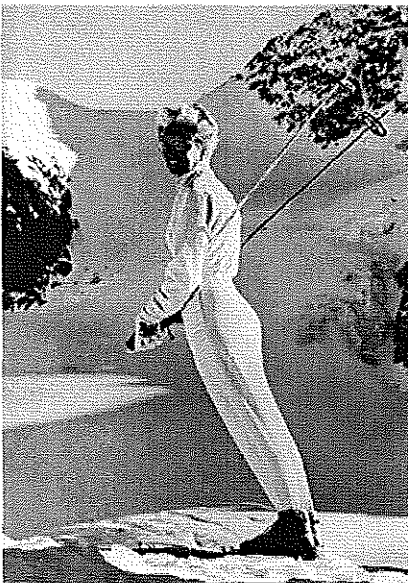
In Munich, Germany in early 1950, Maria Bogner and her husband Willy had become increasingly disappointed with the look and feel of the available selection of ski wear. Tired of waiting for the ski clothing manufacturers to come up with something better, they decided to create their own designs.

In 1951, they were shown a new fabric that combined wool with a new Swiss nylon called Helanca. Helanca was unique because it could be pulled in any direction and still return to its original shape. Once fashioned to fit the body, it was sleek, sexy and, because of its wool content, warm.

Although the new material was difficult to tailor, Maria and Willy continued to test and experiment. By 1952 they had engineered a design that worked. That very ski season Maria and Willy introduced their new stretch pants to the world. The pants became an instant success. They were so popular the Bogners could barely keep up with the demand.

In 1955, they began offering their new stretch-pant designs in bright, non-traditional colors and patterns, all selling for the unheard of price of forty dollars and up. The designs were so amazing, skiers snatched them up several pairs at a time without even considering the price tag.

Bogner Stretch Pants were so popular, merchants had a difficult time keeping them stocked. As SKI Magazine reported, "Racers, who once wrapped thongs around their pants to prevent them from flapping, switched to stretchies. Marilyn Monroe, Ingrid Bergman, and the Shah of Iran wore them. Henry Ford ordered fifteen pairs!" Almost overnight skiing had been transformed into an elegantly fashionable and highly visible sport.⁹¹



Maria Bogner models her new stretch pants. Photo courtesy of The Book of American Skiing



Wild 1970s fashions featured a variety of shapes and patterns. Photo courtesy of Aspen Historical Society.

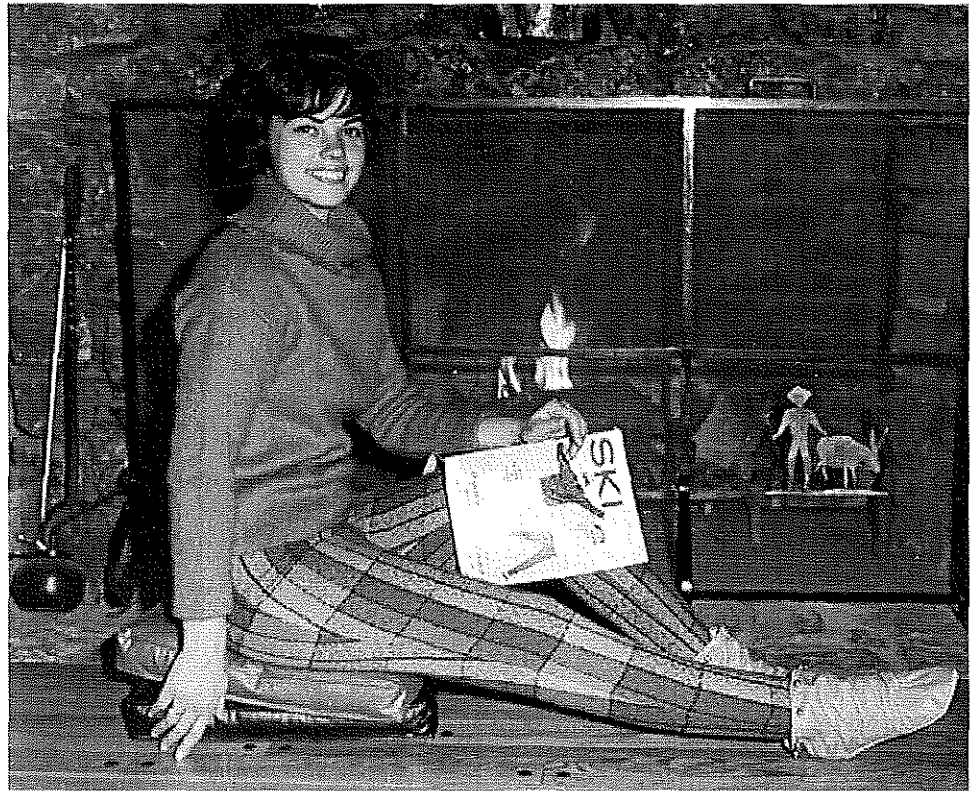


Jumper pants were sexy and functional because snow could not find its way in after a good fall. Photo courtesy of Aspen Historical Society.

The Age of Aquarius

Following the popularity of stretch pants, ski clothing proceeded to get tighter and sleeker until some skiers were wearing stretch fabric from head to toe. Despite its overwhelming popularity, however, a number of deliberately non-stretch fashions and fads also began appearing on the slopes. Rebelling against the status quo, some young skiers in the sixties began sporting wool shirts and Levi's in an attempt to establish their originality. Ironically, these skiers were unknowingly imitating a look that was first made popular by the Sierra Snowshoe racers in the late 1980s

Those who supported rebellion yet preferred to stay warm and dry wore big, puffy down parkas and vests made popular by Sport Obermeyer in Aspen, Colorado. The bigger and baggier the jacket, the better. These Parkas and vests were much warmer than earlier models thanks to Klaus Obermeyer's early innovative use of down as a ski clothing insulator.



Turtlenecks were extremely popular and were sold in a variety of colors designed to highlight the skiers tan. Photo courtesy of Aspen Historical Society.

Klaus Obermeyer

In 1947, when wool was still the material of choice for most winter outerwear, Klaus Obermeyer arrived in Aspen, Colorado to work as a ski instructor. Tired of watching his students freeze in the high altitude air, Klaus decided to design an insulated jacket, a concept that was almost unheard of before the days of Gore-Tex and Thinsulate.

Klaus invented the first insulated parka by filling a quilted jacket with the down feathers from an old comforter. According to Klaus, getting it right was a bit of a process. The first coats “looked like the Michelin man” because all the stuffing fell to the bottom. Klaus eventually worked out the kinks and his down-filled parkas became a long awaited success.⁹²

Klaus went on to pioneer other inventions in ski wear including the first ski gloves shaped like a hand, the first nylon wind shirts and the first quilted parka. The company he created, Sport Obermeyer, is currently the largest skiwear-only manufacturer in the United States.



Klaus Obermeyer, c. 1955 Photo courtesy of Sport Obermeyer.



60s fashions. Photo courtesy of Sport Obermeyer.

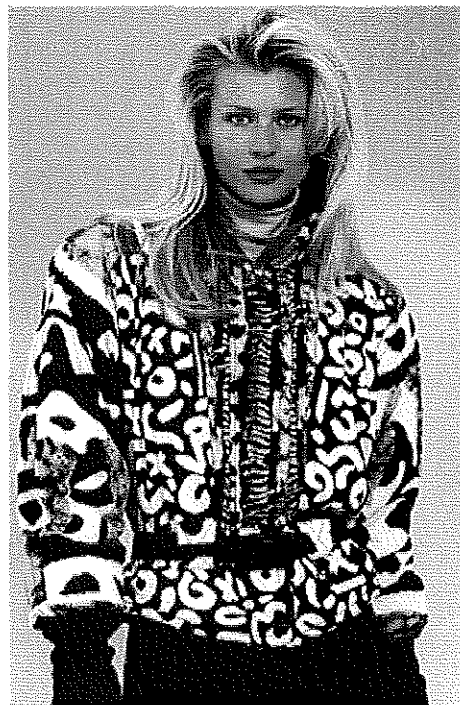
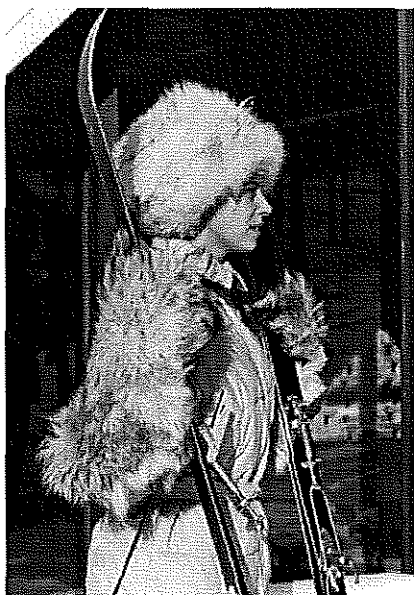


Photo courtesy of Sport Obermeyer.



Nylon and fur. Photo courtesy of Aspen Historical Society.

During the late sixties and early seventies the prevailing fashion ideal was simply to be seen. The more attention an outfit could attract on the slopes, the better. During this era of "anything goes," skiers wore in-the-boot-pants, long belted "tow coats" and hip-length, turtle neck sweaters designed to highlight their "skier tan." Each item featured an explosion of polyester materials, bright colors, heavy textures and wild patterns. Stretch material continued to be fashionable as did the down jacket.

From 1975-1986, three distinct looks characterized ski fashion. The Racer Look, typified by sleek nylon suits with "sausage padding and stretch action stripes," the Coordinated Look in which everything (right down to underwear) matched, and the High-Tech Look complete with Gore-Tex Parka, waterproof/breathable pants, gaiters, Gore-Tex/Thinsulate gloves and Vuarnet sunglasses. Of these three, the High-Tech Look survived, spawning a whole new generation of ski apparel.⁹³

GORE-TEX

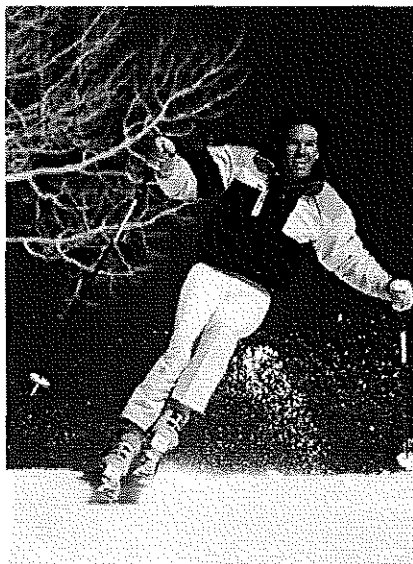
Gore-Tex is probably the most identifiable product created for the synthetic age of ski wear. The fabric garnered attention from the ski industry when it was first used as a glove insert in 1982. Today, the uses of Gore-Tex have been expanded to include all types of skiwear from head to toe.

W.L. Gore and Associates, the company that manufactures Gore-Tex, was founded in 1958 by Bill Gore, a former DuPont research engineer who worked on the original research team for PTFE (Teflon). When Gore left Dupont and started his own company, he began to develop a wide range of uses for PTFE including the weatherproofing of fabrics. He and his son, Robert, believed that if they could only "stretch" the molecules in Teflon, they would have a revolutionary new kind of material.

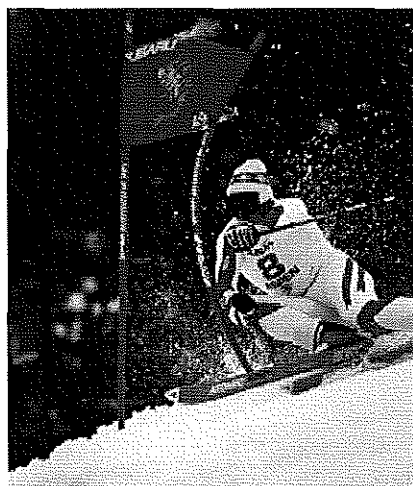
They began by heating rods of plastic until it became pliable. Then they tried to stretch it. Unfortunately it would only stretch so far before breaking. They experimented with numerous techniques with little success. Finally, in 1969, a frustrated Robert yanked violently at the Teflon, rather than trying to stretch it carefully, and to his great surprise, the material did not break. Robert's breakthrough discovery of expanded PTFE eventually led to the development of Gore's most famous product, Gore-Tex.



Klaus Obermeyer Jr. wearing high-tech, high-performance Gore-Tex. Photo courtesy of Sport Obermeyer.



Andy Mill demonstrates his skills wearing waterproof and breathable Gore-Tex pants and parka. Photo courtesy of Aspen Historical Society.



Marc Girardelli of Luxembourg captures first place in Aspen's 1985 World Cup Giant Slalom event. He wears a newly introduced, nylon racing suit and bib for less wind resistance in a sport where every millisecond counts. Photo courtesy of Aspen Historical Society.

Gore-Tex was patented in May 1970. Its best known use is as a razor thin membrane that is laminated to outdoor wear to make it waterproof, yet breathable. This wonder product reshaped the company's future as well as the future of skiing. Today waterproof, breathable fabrics have become the industry standard.

Present Day Ski Wear

Today's skiwear is some of the most specialized clothing around. It is designed to look great and engineered to perform. The prevailing fashion philosophy is layering. This includes a wind and waterproof jacket and pants on top, a thermal underwear layer next to the skin, and an insulating layer or two in between.

Uninsulated shells, designed to be worn over an insulating layer, are the current favorites in skiwear. These pants and jackets come in various styles, weights and colors and are almost always weatherproofed. Many style come with a mesh lining designed to enhance breathability.

Synthetic materials such as nylon and polyester are still favored shell construction materials. The most commonly used fabrics include Antron, Supplex, Stunner, Tactel and Taslan. Some of the more technical lines use rugged synthetics such as Berguntal and Caprolan. Stiffer materials such as Cordura are used in high-abrasion areas.

Thanks to the breakthroughs made by the Gore-Tex laboratories, most skiwear fabrics are now treated with a coating or laminate to make them waterproof as well as breathable. This is true for both technical and fashionable skiwear. These coatings and laminates feature microscopic pores that allow moisture to escape but are too small to let snow and rain in. In addition to Gore-Tex, common waterproof-breathable fabrics include Activent, Dry-Loft, Durepel, Entrant, Exceltech, MemBrain, Sympatex, Triple Point Ceramic, Ultrex and WindBrake.

All of these shells require an insulating layer for warmth. Currently, the most common type of insulators are those made of quick drying, durable synthetic fleece—

a fabric originally introduced under the brand name Polartec. Fleece insulators range from high-loft to low-loft and provide warmth without bulk. Popular fleece garments include pullovers, full-zip jackets and vests. Fleece has also been combined with stretch material for long johns.

Down, the very first insulation material used in skiwear, also remains a popular insulation material for ski clothing. It is soft, lightweight, and durable, and maintains a high loft, which creates a puffiness that endures as one of ski fashions timeless looks.

Though other skiwear brands do exist, the most common manufacturers include:

- Alpine Design
- Belfe
- Bogner
- Boulder Gear
- CB Sports
- Colmar
- Columbia
- Couloir
- Descente
- Fera
- Fila
- Gerry
- Hard Corps
- Head
- Helly-Hansen
- High Sierra
- Kaelin
- Killy
- Linda Lundstrom
- Lowe Alpine
- Marker
- Marmot
- The North Face
- Maser
- Mistaya
- Mobius
- Mountain Hardwear
- Nevica
- Nils
- Nordica
- Patagonia
- Roffe
- Rubicon
- Schoffel
- Serac
- Sierra Designs
- Silvy
- Skea
- Slalom
- Solstice
- Sportalm
- Sport Obermeyer
- Spyder
- Sun Ice
- Tenth Mountain

With so many brands to choose from, skiers are guaranteed to find a style to match their design preferences as well as their skiing needs.



FOOTNOTES

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- ⁴⁷ Bays 52.
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⁶³ Cliff Meader, "Bindings: Feel the difference," *Skiing* 196 (1995): *InfoTrac: Expanded Academic Index/ASAP*, online, Information Access, 29 Jul. 1998.
⁶⁴ Cohen 102.
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Back Country (magazine), editorial office at 7065 Dover Way, Arvada, Colorado 80004.

Cross Country Skier (magazine), editorial office at P.O. Box 5020, Minneapolis, Minnesota 55405.

Freeze (magazine), editorial office at 929 Pearl Street, Boulder, Colorado 80302.

Inside Tracks (newsletter), editorial office at 481 Sandy Point Avenue, Portsmouth, Rhode Island 02087; e-mail, Itracks@aol.com.

Powder (magazine), editorial office at P.O. Box 1028, Dana Point, California 92629.

Ski (magazine), editorial office at 929 Pearl Street, Boulder, Colorado 80302.

Ski Canada (magazine), editorial office at 47 Soho Square, Toronto, Ontario MST 2Z2.

Skiing (magazine), editorial office at 929 Pearl Street, Boulder, Colorado 80302.

Ski Racing (newspaper), editorial office at P.O. Box 1125, Waitsfield, Vermont 05673-1558.

Ski Tech (magazine), editorial office at P.O. Box 1125, Waitsfield, Vermont 05673-1558.

Snowboard Life (magazine), editorial office at 353 Airport Road, Oceanside, California 92054.

Snow Country (magazine), editorial office at 5520 Park Avenue, Box 0395, Trumbull, Connecticut 06611.

TransWorld SNOWboarding (magazine), editorial office at 353 Airport Road, Oceanside, California 92054.

VIDEOTAPES

Beyond the Groomed. Free Heels (800-227-2054), 1996.

Fire on the Mountain

Five Winter Stories. Warren Miller Entertainment (800-523-7117), 1995.

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WEBSITES

AMI Ski and Travel News: www.aminews.com

Cross Country Ski Areas Association: www.xcski.org

Cross Country Skier (magazine): www.crosscountryskier.com

iSki: www.iski.com

National Ski Patrol: www.skipatrol.org

SkiCentral: www.skicentral.com

Skinet (*Skiing* and *Ski* magazines): www.skinet.com

Ski Canada (magazine): www.skicanadamag.com

SkiNews (Utah): www.SkiNews.com

Ski Tour Operators Association: www.skitops.com

SnoNet: www.snownet.com

SkiFest: www.xcski.org

Snow Country (magazine): www.snowcountry.com

SnowSports Industries Association: www.snowlink.com

SnowWeb: www.snoweb.com

TravelBank Systems: www.abwam.com/tbs

U.S. Ski Team: www.usskiteam.com