

# *Nordic Ultra-Tune Update*

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## **NUTS News & Personal Matters**

Word seems to have started to get out already, but this is my formal announcement: after six years as owner and operator of Nordic UltraTune, and after 34 years in the ski business, I've decided to move on.

I have sold Nordic UltraTune to Mark Waechter, of Winthrop, Washington. For more on Mark, see below – but rest assured that Nordic UltraTune will continue all the same services, and because Mark is moving the machinery into a larger space and will be able to employ assistance (zoning prohibited me from doing so, as did lack of space), service should be faster than it has sometimes been in the past.

I will still be closely connected to UltraTune. I'll be on hand in many ways: as advisor, consultant, grind tester, available for extra help, involved in the newsletter (which should be more frequent!), certainly available on-line for any questions, doing service at World Cup races (where Mark will join me in providing event service), planning new grinds.... Mark has been working with me all spring, and I am confident that other than a new address, customers will see little change.

It was time. There was simply more work coming in all fall than I could handle alone, and it was becoming impossible to do anything other than work in the shop – and I want to ski! Physically, with a deteriorating left ankle, it was becoming both painful and detrimental to be on my feet all day – and I want to spend my remaining on-my-feet time doing more than minding the machine! And it's time for some changes, more training, travel...

But more than all that, one of my deep regrets was that in the last six months before he died in a traffic accident two years ago this April, I had had too little time for my partner Chris – and what time I did have, I was often too busy to do much. I wish we had had more time to do things together, and losing him has certainly given me an idea of the fleetingness of time and life. It was good to be busy after his death, for a while. But now I have been fortunate enough to meet someone I want to spend the rest of my life with, and I do not want to lose time with Eric by being always busy or worn out.

I look forward to the next years with great eagerness, just as I look back on my career in skiing with enormous satisfaction. I thank all the Nordic UltraTune customers who have made the last six years so good. I'll still be around – but I'll be skiing!

## **Introducing Mark Waechter**

This summer Nordic UltraTune will be moving to Winthrop Washington, in the heart of the Methow Valley with it's 200 k's of groomed trails. (If you haven't been there, you owe yourself a trip!)

Mark and Margaret Waechter have the enthusiasm and experience to keep UltraTune moving forward. I will be working with them to assure that the Tazzari and the grind process will be perfectly dialed in for the fall opening.

Mark brings a tremendous set of skills and a passion for skiing to the business. For the past fifteen years he has been a research, design and development engineer, holding a dozen international patents for sensors, mechanisms, systems and processes. His design background is

in aerospace and medical and commercial electronics. His rigorous and methodical hands-on science background, combined with his innovative thinking, will benefit Nordic UltraTune and all the NUTS customers.

Mark is an avid skier, with experience regionally and in Masters' Nationals and World Cup, and in American Ski Chase events. Margaret is a former Canadian national Team member, and more recently a Masters' World Cup medalist. Before moving to Winthrop, Margaret was Head Coach at Sovereign Lake Nordic. She holds a degree in Exercise Physiology and is an ASCM Board Certified exercise specialist. She coaches at various camps and clinics, and directs the Health Science Lab at Winthrop Physical Therapy.

Nordic UltraTune will continue to focus on providing the highest quality Tazzari stone-grinding service.

Our web address will remain the same ([www.ultratune.net](http://www.ultratune.net)). The shipping address and phone number will be changing over the summer, and we will keep you fully informed.

### **New Grind**

After the Salt Lake Olympics we introduced a new two-layer cold grind, the xc02. This was originally designed for very cold, dry snow, but on-going testing showed it to work over a far broader range than anticipated, all the way up to – 5°C in low- to medium humidity and/or aggressive snow. The grind was extremely “free,” owing largely to a minimalist approach which gave the snow crystal almost nothing to grab (the principle of minimal mechanical interaction with the snow).

Back around before Christmas we started to experiment with a new version of this grind, the xc02L (believe it or not, all those numbers and letters *do* mean something!). This grind has proven even more versatile, and is now what I automatically do in place of xc02. In future Order Forms and price lists, xc02L will be the cold/fine snow standard grind.

(Interestingly, the development of xc02L has led to some very interesting new ideas which we are experimenting with applying to almost all grinds. It has been a lousy year for testing however, so

conclusions will need to wait for next season. Stay tuned!)

### **Death of WC+**

Some of you may have noticed the sudden dramatic rise in price of the World Cup Plus waxing service. I found that WC+ waxing was taking a full extra day, and starting to cause some very high electric bills for all the hotboxing, and so decided to price this service off the market. I apologize for any inconvenience this may have caused – but there is very little of the WC+ protocol that can't be done at home, and if you have a hotbox, it *all* be done at home. There is a good deal of discussion on hotboxing later in this issue; anyone who would like some photos and building directions should not hesitate to contact me at [natxcgrind@yahoo.com](mailto:natxcgrind@yahoo.com). I'd be pleased to share all the information I have; it's easy, and it's not expensive!

### **NUTS Pricing**

From time to time I get some friendly questions about pricing, or hear of someone who has decided not to send me skis because of cost. I wrote the following to one very good customer who had passed on that a friend of his had decided not to ship skis for grinding. Custom grinding *is* expensive,, but there are very good reasons why this is so:

My process keeps getting complicateder and complicateder...

- 1) Initial flattening and bas analysis with steel scraper
- 2) flattening with coarse stone setting - up to ten passes, because I use slow stone speed, low pressure and high feed speed, to avoid over-heating (remember: the cooling water is triple-filtered and cooled by passing through a heat-exchange inside a glycol-filled freezer; also - high lubricant content in the water that hits the skis, again to reduce heat; the cold water cools the base and not only avoids over-heating, but also makes for a more rigid plastic, which allows for cleaner "cut" on the stone)
- 3) Stone is polished twice (at .04 and -02 mm)

- 4) Skis are polished, with three to four passes, leaving them blank
- 5) Stone is set for the first grind (.04 mm)
- 6) Skis are structured in one pass, at medium to low pressure
- 7) Stone is polished between each structure, so that the structure in the stone goes into a blank stone, and is clear (Thus, for an R grind the stone will have been polished three times, and re-dressed three more - this uses up a LOT of diamond and stone, adding to cost)
- 8) Skis are chemically cleaned
- 9) Skis are "deep-cleaned" with soft steel brush at low rpm
- 10) Skis are buffed with Omniprep, which removes any hair (Omni prep consists of "knives" where all other "Fibertex" pads consist of fibrils of material with "sand" embedded in them)
- 11) Skis are waxed. In the case of Hotboxing, they get an hour in the hotbox at c. 55 C; in the case of World Cup Plus, they get four layers (soft anti-static, soft paraffin, hard paraffin w/ moly of graphite, final high fluoro-layer) - all hotboxed) Note that different waxes are used in the WC+ protocol, depending on the grind/snow for which the ski have been prepared.

**Note #1:** The stone and skis are constantly washed by about 30 gal/min of *chilled* water. This keeps the stone and ski clean, but equally important, holds the base of the ski at a temperature as low as 35°F. This avoids stone-burn on the base (common on many factory grinds), *and* insures a more precise cut because cold P-tex plastic is more rigid (a soft base shreds, while a rigid one cuts). This water is chilled by a custom-built system which circulates the water from the machine through a heat-exchange surrounded by sub-freezing fluid.

**Note #2:** All the water that washes the skis and stone is passed through a unique custom three-stage filtration system, ensuring that no "grit" enters the system, and that grind sludge is not deposited on the base of the ski.

*That's* why I'm so expensive!

Add in that I personally do all of it, inspect the skis at each stage, and often call owners with suggestions & questions.

Not to mention the individualized reports on each pair of skis...

### **Hotboxing**

The following derives from correspondence with Mark Holman. Mark wrote:

You were kind enough to share your experiences with building and operating hotboxes a few months back, and I thought I might return the favor.

I went out and built mine for about \$150 all told. As you suggested I used a baseboard style oil-filled portable heater and two 10 inch fans to circulate the air. However, in place of plywood I used 1 inch thick Tyvek insulating wallboard. It was a little more expensive, but much more efficient and much more portable: the entire box (less heater and fans) weighs less than 20 pounds and I built it so it can be broken down into 2 foot by four foot pieces. Wooden dowel pegs and aluminum insulating tape are used to hold it together. The box is big enough to hold 3 pair of alpine skis.

I have two thermometers mounted in the lid: one in the center and the second about a foot from the end. The temperatures are usually within 1 degree F, so the fans are doing a good job circulating the air within the box. As the heater thermostat cycles, I'll see only about +/- 3 degrees F variation from the set point.

I've experimented with temps in the box. I started at about 112 with 10 hour cycles. The results were OK, but even the very soft conditioning waxes remained relatively "solid". By raising the temperature to 125 F, the whole process took off. The wax became very "plastic" and the amount of absorption appeared to increase dramatically. Harder race waxes also seem to penetrate very well at the 125 F set point. Although I've spoken to some factory race room tuners who have indicated they go into the 145 F range for shorter cycles, I've been hesitant to go any higher for fear of damaging my skis.

*I replied:*

Thanks so much for sharing all this! It sounds as if your box is more sanely designed than mine (the Tyvek) - but mine was a prototype I never

bothered to improve on - and I have no need of portability. I've been thinking of lining mine with drywall, for fire-prevention purposes; weight is no issue with me.

I'm pretty much settling in to 55 C +/- a few degrees. A study from the Norwegians a few years ago - I've lost it since - indicated that wax continues to flow/bond even when not molten, and my tests have certainly indicated that to be the case. I continue to be slightly apprehensive about the effects of heat on the glues in the skis, and I know that circa 55 is safe. Zach Caldwell and I use Star Multiblock yellow far base impregnation. It seems to have by far the lowest melt-point and highest fluidity of anything on the market, and it goes almost liquid at the box temps we are using.

Thanks for the information!

### **Correspondence**

*The following interesting letter is from Steve Nagode; with apologies, I've had to omit the pictures.*

My hot box is finished, and I took some pics that you may be interested in. It's wide enough to fit 8 Nordic skis, and also snowboards and tele skis. Another inch wider would have been good to fit two pair of tele skis flat, but oh well. I started with a 500 watt heater and it was not enough, so I got another 750 watt heater for a total of 1250 watts. 1250 watt baseboard heaters are pretty common, so if I was to do it again a single heater would be more economical. With 1250 watts it is hot in about 30 minutes. There is a sleeping pad underneath and comforters draped over it to save energy.

I picked up a mechanical thermostat at surplus.com. It is heavy duty, so to keep things neat it's mounted inside the box. I do wish that the temperature control was tighter. As it is, it turns the heaters off when the temp gets to 140F (I monitor the temp with a portable thermocouple in my office), then kicks back on when it drops to about 125F. I see nicer digital ones available at Omega.com for \$120, and lots of varieties on EBay for much less. If I have the time to do a little research I could probably get a nice one for \$20, but perhaps it is not really necessary. I also have a timer so I do not forget about the skis and

leave them in too long. 8 hours is what I set it for now.

I also got a nice ball bearing fan to circulate the air from surplus.com. The faces came off the heaters for better heat transfer. The box has two levels, electronics on the bottom, and skis on top. The separation platform is short so there are 6" gaps at the ends, so the air flows over the heaters then up to the skis, down the length of the skis, and recirculates back down to the fan. I set the thermostat sensor right near the heaters so in the event of a fan failure, the system will not overheat.

It is working pretty well, but one thing I am noticing is that the harder waxes (Toko red and grey moly) seem to soak in better than the Toko yellow. When the harder waxed skis come out, they have several white areas where it appears that the wax is totally absorbed, and I can see the base pattern. After scraping and brushing they usually look fine, but on my freshly ground tele skis I had to rewax one area. The yellow wax on the other hand seems to be real close to molten, and perhaps it flows to areas that do not have enough wax. Have you had similar experiences?

*The following note is from Peter Miller, of Bend, Oregon:*

Just a new ski preparation question; actually two -

It appears every wax manufacturer and their techs have directions as to how you prepare the bases of new skis -

What do you recommend as to temperature of the wax used, brushing, scraping, number of applications, etc.?

2nd question is: in preparing the base of a ski that will be used specifically for 30 degree snow temperature and above, do you recommend the same preparation as you described above?

*I responded:*

It's all much simpler than all the reps and manufacturers seem to make it, and there's a lot of voodoo, because not much of the "little stuff" that anyone does really makes a difference - thus, it's hard to disprove various arcane practices.

Keep it simple, and trust yourself. (Hint: in order of importance: the skier, the skis, the wax...)

Iron at as low a temp as you can, and still have the wax melt. With colder paraffins, it may even take several passes with the iron to melt the wax.

For more detailed ironing ideas, see the FAQ's on my website at [www.ultratune.net](http://www.ultratune.net) - or have a look at a copy of my book. Basically, if you avoid over-heating by rotating back & forth between skis, the longer you can keep them warm (warm, not molten) the better. I hotbox everything & minimize ironing.

You can't over-scrape or over-brush, and most people don't do enough of either. For cold snow, let the ski cool outside and then re-brush.

I "clean brush" with soft/fine copper or bronze after skiing and before waxing, and after waxing and scraping, I use a nylon or combi brush. Roto brushes are not needed. They're fine for production lines, but I've done several World Championships with hand brushes. Brush lots.

The fact is, you glide on an amalgam of P-tex and paraffin, not on a paraffin film. So again, if you have good, open bases, you can't over-brush.

For 30 degrees and up, what I do is:

- clean brush the skis (clean wax them if they're dirty)
- apply an anti-static (I use Star Map 200 - this has to be ironed at a VERY low temp). Scrape & brush.
- apply high-fluoro paraffin (I use Star Eclipse yellow, but it's been superceded by a new formulation; as I own most of the remaining N American supply of EC 1 and 2, it will be some years before I switch); allow to cool, scrape, brush. Note: in changing conditions and shorter races, this is all you really need.
- If desired for longer races, the last ounce of speed, or dirty snow, apply appropriate fluoro (I use solids, and I cork vigorously, rather than iron); brush with dedicated fluoro brush

*From John Brodhead, Craftsbury Outdoor Center:*

I would like to evaluate my skis for their need of stone grinding. You mention in your article for *Master Skier* and on your web site the main cause for needing grinding is bases that have been over-

heated and base material burned or melted by waxing too hot or too long. I'm not talking bubbling the ski here. You mention one of the ways to spot this is "graying" of the base or quick wear from skiing of wax on certain parts of the ski. Is there anything else you look for? For example if a ski has been over heated and has not been used since its last waxing what do you look for? Is it helpful to look at the structure of the base with a magnifying glass. Can you see damage with say 10 or 20 x magnification? What would you look for? Under magnification the fine structure of all my skis look the same to me. Do you have photographs to illustrate what an over heated ski looks like at magnification or unmagnified?

How do you apply hi fluoro waxes and straight powder fluoro waxes with an iron without burning the ski. In both of these cases, unless you own a gold mine or two you can't afford to melt or sprinkle on thick layers of the wax to protect the ski while ironing. Do you just assume that after so many fluoro applications you will have effectively sealed the ski and will have to regrind to recondition the ski?

You praise the effectiveness of "hot boxing" skis. As a botany student I used to prepare microscopic specimens of plants for sectioning and mounting on a microscope slide by "hot boxing" the specimen in paraffin for several days in order to get complete paraffin penetration. This certainly was not rocket science. It seems it would be easy to build a "hot box" for skis with a small heater and a thermostat for home use. I have not seen anything commercially available. It would seem with all the benefits it would be a good idea. Do you have specs for building one or know of a commercial supplier?

*My answer*

Thanks for the note! Some good questions: would you mind if I used your letter and my answers in my next newsletter?

I'm a bit sensitive about the *Master Skier* article :) It got edited almost past recognition (and the ad has a wrong e-mail address, plus copy didn't write!) Anyway...

It's very hard to tell if a base is sealed without touching it. I steel scrape all the skis I get into make sure there is no wax on them, and the feel of the scraper is my diagnostic tool. Rarely are

bases over-heated enough to bubble (but boy! have I seen some!), and over-heating is often cumulative and sneaks up. Quite aside from being over-heated and sealed, bases simply deteriorate, clog, and slow down. A good grinding will almost always make a very noticeable improvement in wax retention and speed. Quick loss of wax in the glide zones often means a sealed base.

Graying, etc. is generally a sign that sealing has gotten fairly advanced; or it may also be a sign of uneven pressure distribution. Incidentally, if graying is a problem ironing in a layer of hard moly- or graphite-based wax will prevent this to a large degree, by hardening the base somewhat, and renewing the graphite in the base, which has the effect of providing a self-lubricating base, and of reducing static buildup, which holds dirt and thus adds to abrasion.

There's nothing you can really see, although to the trained eye, a fresh base has a deeper, more "silky" look. I have no photographs, I'm afraid. Again, my best diagnostic tool is scraping.

Applying high-fluoro waxes should not mean using any more heat than any other wax. I iron very quickly, so heat can't build up (see attachment) and I almost always use the hotbox. As to pure fluoro, there are two ways to put them on (always over a high fluoro, which serves as a very necessary base, or inter-layer between the P-tex of the base, and the fluoro, which doesn't want to stick to P-tex):

- 1) Iron VERY fast, but tapping the iron on the fluoros, then one quick pass.
- 2) Corking.

In fact, I tap the fluoro on, then cork for maybe 5 minutes. Eventually the fluoro will "disappear". When it does, it's on. To avoid aerosols and speed the fluoro up, by the way, spray the base with water, then brush wet.

It's probably a good guess that many fluoro applications may seal a base. I can usually feel then when scraping or grinding a skis. Almost always there will be darker/harder "splotches" on the base. The real damage though, generally comes on skis from the mid-West and Colorado, where people use a lot of really hard paraffins. I can sometimes guess where a ski is from, just by the feel!

For those of us without a goldmine in the backyard, solid fluoros are a more efficient alternative. You don't need a ton of fluoro: just an even layer. This layer is actually an extremely thin membrane which is attached to the fluoro part of the fluoroparaffin base wax. Crayon on, cork, maybe crayon another layer on, cork. No ironing really needed unless it's a very long race, or in very abrasive snow, when ironing *may* last better.

*From Gabe Hanson:*

I recently had you grind/hotbox/wax some skis and I am anxious to use them! Hopefully we will get some new snow soon. I was wondering if you could help me out with a question about a new pair of skis that I am intending to purchase soon, and of course, have you "soup-up" for me.

Here is the deal:

The skis are new Atomic beta race RC:11 Classic skis (wax kick pocket, not waxless).

I am wondering how important camber is in ski selection. Does it make a significant difference in ski performance?

I am 6'2, 190lbs. The Atomic charts recommend a .9-1.2 camber with medium flex for my weight. Does that mean that I am o.k. as long as I stay near that range or should I look for a 1.1-1.2 since I am a little tall?

I did find a couple 206cm skis that had a .8 camber. Since it is lower than the .9 threshold above, would it kick better though compromising a little glide? Do you know if that would be close enough and I should simply not worry about it?

Thanks so much! You can of course decline to answer, but I thought you would be the best one to ask. No one else seems to know the answer.

*My answer:*

Thanks for the note; I'm a Madshus skier, and each brand has a different way to designate camber/flex, so I can only respond in somewhat general terms.

Ski fit is *the* most important factor in picking skis, and even more so with classic skis than with skate skis. If the ski is too stiff, it will be very hard to ski well. If it's too soft, it will drag and lose wax.

Generally, it's best to go with the manufacturer's recommendations, but that needs to be tempered with a degree of self-knowledge. For example, I'm getting out of shape, and can no longer manage a stiff ski, so I shade my ski choice to the softer side for better grip. Height and length are not really an issue: in the old days, a taller/heavier person needed a longer ski for two reasons: better "float" in soft snow; and because we kicked higher, a longer ski was insurance against catching a tip. Nowadays the tracks are all harder, and no one kicks like that any more - so it's no problem having a shorter ski. I'm 6'1", 195, and I ski on a 110, but I've used 105's perfectly happily.

Camber height, as opposed to flex, is I think, relatively unimportant. A higher camber will feel more lively. But the only really important issue is flex: how much it takes to press the wax against the snow. I'm unfamiliar with the Atomic numbers, so I have to pass on that.

Within certain boundaries, I wouldn't worry about compromising glide. You spend 70% of your time climbing hills, and you want a ski that will kick. A slightly faster one that will be harder to get up the hill with may be gratifying on the downhills, but if you lose 30 seconds going up, and gain 5 coming down, you're better off climbing well.

So, knowing your own capabilities, pick a ski that will work for you, not against you. In the end, I prefer a paper test to any numbers. I prefer a ski with a long wax pocket at half weight, but one I can almost flatten at full weight.

I'm afraid that's all very general, but I hope it's of some use. But the simple rule is that numbers matter far less than what you know you can do, and what you need. In the end, it's better to err on the side of ease of kick: remember that by the end of a race you'll be tired and may have lost some wax - and you want a ski that will work well then. not one that will go like a jet in the double pole scramble and the first downhill (the same goes with picking kick wax).

*From Mark Waechter, when he was still an innocent civilian:*

How about making something like the xc02 for warmer conditions? start by grinding a little deeper, so that the polishing stage leaves a bit more structure? The xc02 is the answer for

what I used to do with LJ03 - I typically take a razor and shave the LJ03 down a bit to make them run more "quietly" (yes, I listen to them in the snow), and faster. I agree that all the sharp edges make them grabby, and agree that a final run through to level it down is a great idea.

*My response:*

Zach and I messed around with an xc03 - an LJ03 with a polish - and never could make it work. My tentative conclusion was that when deeper structure is needed, sharper seems to work better, as well as depth. Structure can be cut at .02 and .04 mm automatically; it's easy to go to .06 by hand (so perhaps an xc02 at .06 rather than .04), and Zach has had some success with this, as a sub-layer for double and triple layered structure, if I understand him right.

One of my contentions is that *commercially* we need to stick to a few relatively simple, broad-ranged structures. Racers, and people with access to a grinder, can have grinds made to very narrow, specific conditions and specifications. Three problems arise from this:

- 1) Outside these narrow parameters, the grind won't work as well as the good, solid all-rounders like LJ03 (don't underestimate it: it's the single most versatile grind), xc02(L), and R2.3
- 3) Very delicate grinds, like Z40 (.02 depth at the finest cross-grind settings; so delicate the diamond has to be specially shaped) or some of the triple-layers, tend to wear out very quickly.
- 3 You need a ton of skis to pull it off - and *that* implies not only deep pockets, but a knowledge of when to use what ski. Which leads me back to thinking that 99% of us need to stick to one or two good pairs and learn how to use them.

For the general public, it needs to be kept simple, reliable, and made as long-lasting as possible. For Master racers, ditto, although they love complications - the problem being that they worry themselves silly about the smallest variation in grind, and if someone beats them with a X42z.2 grind when they have the R2ss14 grind, they panic, and more "buzz grinds" are spawned, complicating the life of the grinder, and distracting them from the Truth that a good pair of skis and good technique will knock the right grind silly.

My intuition is that x-c (I refer to the racing side) is complicating and pricing itself out of

existence. When to be competitive as a service person, you need a \$100,000 grinder (an expense which has to be passed on to the skier); when to perceive yourself as competitive you need next year's skis with an MW13.4Z grind - we're ruining something that I believe is essential to the sport.

And I'll bet Thomas Wassberg, without having trained for a decade, could still beat anyone I know, hands down, on the oldest skis I own, with an LJ03 and Extra Blue.

I believe service people and racer chasers need to take a leadership role here, because in my perception, the landslide is taking out the village: who can afford to get kids into the sport? Or be in it?

Or maybe I'm just a nostalgic Old Timer. At any rate, I'm loading the car and heading for Stevens Pass. One of the worst things about the ski grinding business is that I never get to ski. Time to change that!

*An extended correspondence with Dan Truesdale::*

You mentioned that some service people feel 3 passes [with the iron] are enough. Do you mean heat wax in on 1st ski then do three passes with iron and then do the same with second ski and then that's it? I thought a hotbox was mainly for initial ski prep when you want to saturate base with warm wax. Do you use hotbox for other applications?

Tendrils of base material [we were discussing bases that "gray out." The gray spots are tiny tendril of base material that have lost their "black") - are they being pulled to the surface by lack of wax? Sort of like sandpaper rubbing on the base? When they get pulled to the surface some of them are not dyed black so this is what I am seeing? What is the reason a base is dyed black?

*My answer:*

The idea on ironing is to keep the base & wax warm. Three passes shouldn't take longer than a minute or two, from putting the ski into the vice, to the last pass. Some service people feel that the three passes are enough. Three times three is a council of perfection - with the idea of keeping the ski/wax warmer longer. I'd be glad to send

instructions for building a hotbox, which is the best solution of all. Or do more passes - just be sure not to allow too much heat to build!

The white/gray look is very typical on artificial snow, which is generally extremely abrasive. I'd expect some graying or whitening to occur. If it wipes/brushes off easily, what you are seeing are tiny tendrils of base material which have abraded loose and contain no coloring. (Bases are black because of dye and graphite). It's not oxidation. One way to slow this down is to iron a very hard graphite- or moly-based wax into the base. This will renew the black color, as well as renew the anti-static properties of the base, and the hardness of the wax matrix will also "armor-plate" the base somewhat. I'd recommend Star Map Black, or Toko moly (mixed 2:1 with blue, to harden it). You can also do a layer of graphite/moly, then a layer of something very hard, then your wax of the day. Other graphite will work well too -it's just that I work mostly with Star & Toko.

*Dan*

*again:*

Hi Nat, to be honest, I never have really cleaned my iron. Well, maybe once with a paper towel. Question: What do you recommend I use to clean a wax iron and what is the correct procedure? Also how often should it be cleaned and why is it important to clean if it is just wax being melted on the iron?

*I replied:*

If there's a lot of crud on it, a hot-wipe with a paper towel will take a lot off. Try to get the body, sides and edge of the ironing surface clean as well. The base may need sanding with a very fine paper, and then polishing with something like a 3M Heavy Duty Stripping Pad (Scotch Brite works as well) - or steel wool. Don't worry about scratches, which may actually help channel wax - but the bottom should shine.

Accumulated dirt can cause scratches at worst (keep wax bars clean and never put them down on a dirty surface), and will put burned up elements of the last twenty wax jobs into your wax, thus polluting it. And often smoke is the result of old wax that's stuck in the base.

I always end waxing by wiping the iron clear with a paper towel. If this is always done, there will probably be little build-up.

*Dan wrote:*

Hi Nat, I have a few more questions on ski structure. Specifically the right structure for the Birkie:

1) I am doing the American Birkebeiner this Saturday in Hayward, WI. The current conditions are calling for Friday night lows around 9 deg. F. Highs Saturday around 26 deg. F and mostly cloudy skies. I use Toko wax and go by their wax recommendation that they post on their site. Their wax rec. says " expect packed powder/machine track conditions getting skied in as more skiers pass over the course." From this description, I would expect transformed snow from the grooming and all the skiers. Because the hills at the Birkie are usually soft and chew up I plan on using my Softer tip/tail Rossi's that you put the "XC02" grind in. Will this grind be ok for the Birkie? I know you mentioned it is designed for new and low humidity snow. I am not sure if there will be new cold snow(sharp crystals) and I think here in Wisconsin we usually have more humid conditions? Toko is suggesting to have a cold universal, non-linear grind and or one pass with the coarse non-linear Toko Structure Right tool. If they are suggesting a cold universal grind does this mean they are anticipating sharp crystals and my XC02 grind would be good? Please advise if I my grind is ok or if I should get additional "hand" structure put in my Rossi's.

2) Can I go back a step? What exactly is the purpose of structure in a ski. I sort of understand why if you have wet snow you would want non linear "channels" in the base to prevent suction. Why do you want structure in other conditions? I was reading a wax manual and they suggest to have skis with designated grinds: cold grind, wet grind, a linear grind, and 2 with all around grinds. For a working man(and non sponsored skier!) can I get by with only 2 sets of skis with different grinds(XC02, LJ03).

I was also reading that when the snow is machined the more aggressive structure can be and for corn snow a deep aggressive linear structure works well. What are they getting at here? Basically I would like to keep this somewhat basic and simple. If you can give me any suggestions on keeping it this way let me know.

*In answer:*

Boy, I'm all for simple!

One very important thing to keep in mind when people start talking about structure, is that almost the right structure is as good as the right structure, and that old structure is almost always better than new. Many of the recommendations that Toko and service people such as myself make, are councils of perfection, differences of .1 km/hr, etc. In my own case, I keep skis in LJ03 and R2.3, and ski 90% of the time on the former. I also have an xc02, but we have not had non-kliester snow so far this year, so it's been little used.

But to answer your question:

Structure is to break suction. That at least, is the old answer, and certainly makes sense in wet snow or snow where ski friction creates peripheral melting and thus water. I have a personal theory that it also channels air, No one has seen any of this actually happening however, so what we really are doing is empirical - we just know various structures work better.

Lately, Zach and I have both been reaching the conclusion that finer is better (given the caveat that finer structure won't last as long). One reason for this may be that finer structure captures less dirt. But the main reason is that finer structure interferes less with the snow on a mechanical level (the "snow tire effect" is not what we want on our own skis!). I've read somewhere that structure should be about 1/2 the size of the snow crystal - but I don't know. Certainly, my experience of both stone grinding and hand structure has been that finer (which also means more "footprints," or "rills" per inch) is freer and faster.

So, the Birkie: on the whole, the ski will be more important than the wax or structure. Go with the ski you think will do best, and it sounds to me very likely that the softer tip will be best, for the conditions you describe. Wax for durability (err on the harder side). As to structure, my guess is that the xc02 will be fine all the way up to -5 or so, and that in loose snow, structure matters less for water-draining (or whatever's going on) than does non-interference with the crystals. I'd stay well away from coarse hand-applied structure, as these tend to raise bumps, and give the crystals something to bite (which is not to say these aren't very good in some conditions). Any hand structure will ruin the xc02 - which is not to say

that it might not be the best thing under the conditions.

I prefer to make interrupted structure (read "non-linear") by running two grades of linear riller over the base; these will naturally spill into each other, and create an interrupted structure - and I am starting to move toward longer "footprints" on my grinds (xc02L is my newest; Zach's Z40xl is another, more precise way of making longer structure). In this case, a very light pass with medium rill, then another, equally light pass with a finer riller (say .5 and .25, or .75 and .5) might work, especially if it's done before all the waxing, and has time to soften a bit.

On the whole, I think I'd go with the xc02. But you're on the spot, and the Toko guys are good.

As to your last question, when the snow is machined (and heavily skied) it undergoes transformation into more coarse crystals. Coarser crystals mean coarser structure, and in machined-up, dryer snow, a linear structure will be good. Something like the LJ03 perhaps, but in my experience rilling (which is true linear) is never as fast as some kind of an interrupted structure (like LJ03): the true linear merely channels water down along the base; *some* kind of interruption breaks the suction better.

I've probably complicated matters further... But in the end, go with a good ski, and don't worry that much about the structure, which ahs to be fairly far out to have much of an effect. The race is won on good skis - by a good skier with good tactics and technique (any maybe some training!)

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To a customer confused by various high-tech articles (elsewhere!) on brushing, brush selection, etc.:

I got a call on the Brush Question yesterday, as a matter of fact.

Remember when Bjorn Daehlie lost the gold medal when Lars brushed the sub-layer under the high fluoro base for pure fluoro with the wrong brush? ☺

What really needs to be stressed is how very little all this matters. I did Ramsau with three brushes, and we had dynamite skis. What matters: the skier (technique, training), the ski, then nothing

for a while, then structure & wax (and almost the right wax/structure is as good as the right wax/structure for 99.9% of us - unless you're way off.)

I think there is mileage to be made out of simplification for reasons of both sanity (relax & go with it) and finances (who the hell can afford enough skis to have all possible grinds - and what if the right skis have the wrong grind...?).

I do remember Thomas Wassberg damn near setting a course record at the ranch with the wrong skis... and stopping to talk to everyone he passed!

Frankly, I think the whole thing is spiraling down into insanity, and *someone* needs to start a Crusade for Common Sense!

*A note from Doug Cuneo:*

Hi Nat- to follow up on our conversation this past weekend at Stevens Nordic:

Your fall edition newsletter (volume7, #1) mentioned a waxing bench made by Charles Caswell. I ended up buying one as a Christmas gift for my brother, for several reasons. I visited Charles in his shop (he's a woodworker/designer) and was impressed by his knowledge of materials and method of operation. The bench itself is practically a work of art. The main platform is made from beech, the forms which support the ski made from Baltic birch ply. The forms slide on a metal rail so it's completely adjustable to handle any ski. The ski attaches by clipping the binding into a central metal loop which can be adjusted as well. The bench can be bolted to a work table (bolts are included) or clamped via c-clamps. Pretty easy. It's sturdy, functional, and pleasing to the eye.

I was planning to shop around for various waxing benches but when I saw Charles' it became clear no further shopping was needed. He does a great job. Total cost is \$175, more than most benches but worth the extra money. Charles has recently made a leg unit compatible with the bench.

### **General remarks on Grinds**

Grind choice should be related more to which flex works best in what snow. The ARC is often a good soft-snow ski, and the Madshus 274-hard is often *not* good in soft snow. This being the case,

an xc02L (the "L" is a new version) might be best on the ski you pick for cold/softer snow. The LJ03 remains good for a broad range, so might be better for a ski that you want to go warmer with, and is also good for the "general" skis.

The xc-series grinds are quite shallow and delicate, and so will last less well than more aggressive grinds. The LJ- and R- series are twice the depth, and will last very well. It's hard to say how long - much depends on how they're treated (hint: no steel scrapers allowed in the same room with a stone-ground ski!). A grind should last all season - but it's usually the case that before the grind wears out (by the way, some grinds are faster when worn-in, or rounded, in some conditions), the ski will need re-grinding because of scratches, or burned/sealed bases.

Keep an eye on your waxing temp. Bases start to melt at 85C, and really melt at 135C. Even with the hardest waxes, there is little reason to go over 130 at the most, and a great many waxes will iron well at 110, or even lower. Having said that, some service people such as Peter Hale and Zach Caldwell, prefer to use a hot iron (130, perhaps) and move it very fast. Wax is absorbed as a product of time/temp, so the hotter the faster, the "colder" the slower. The trick is to balance wax absorption with accumulated-heat damage to the core (crucial in Madshus skis, which are quite heat-sensitive) and base. Personally, I iron once or twice at about 130, very fast, then pop them into the hotbox. I recently re-ground my best classic skis (owing to scratches, and because I get a huge discount!) and found the bases to be extremely sweet: soft, open, and even, holding wax very well. This pair has had nothing but quick ironing, then hotboxing. I'll include hotbox directions, below. It's cheap, most effective, and good ski and grind insurance!

### **For the fun of it**

*Major* wax break-through! I have inherited a "new" table from my mother, a mid-nineteenth Chippendale. I refinished it this fall: 13 coats of tung oil, 4 or 5 of furniture wax. Nice glow, but it stains with water or skin oils. So, today, I had The Idea: I sprinkled Ski\*Go 44 (pure fluoro powder for old snow, like F2) on it, and corked the dickens out of it with a Swix felt fluoro polisher - and voila! The best polish I've ever seen, and it should be hydrophobic.

Second layer tomorrow.

Now to work on structure...

### **A little praise**

With thanks to Jim Litchfield:

I wanted to thank you again for the grind you did on my wife's Atomic Beta 10s. We struggled with these skis all last season not being able to hold a wax. You ground and hot boxed them this fall.

I followed your instructions and put some Moly into them with a daily wax. She was able to take them out yesterday for the first time. She actually had such a different experience with the skis she couldn't believe it. She couldn't believe how easily the skis moved. You have freed up a lot of waxing time for me this season!!

Thanks again and look forward to more skis from us. Have a great season!

Jim Litchfield

### **Ski bags**

In a recent newsletter I asked if anyone had ideas for a source of really good ski bags. I've since tracked down the best bag I've ever had: the L. L. Bean bag! This bag is built to take direct hits (or airline baggage handlers): it is made of very thick, strong material, straps go all the way around the bag, rather than being sewn or riveted on; zippers are extra-heavy, there is internal padding so that you can separate skis, or separate poles from skis, and the entire bag is padded on the outer walls. This is simply THE best ski bag I have ever found, and it is not expensive: \$59.00

Go to L. L. Bean ([www.llbean.com](http://www.llbean.com)) and look for the Adventure series bags. There is a roller version, an Nordic version, and an Alpine version. I got the latter, as being the widest (I can put 4 pairs in it); be sure if you get the Alpine version, to get the 215 cm model.

### **A Plea!**

I have seven or eight old 16 mm ski films which need to see the light of day again. If anyone knows of an inexpensive service who can convert old movie film (with sound) into DVD or VHS, I'd appreciate hearing of it –and would be more than happy to share copies of the resulting material. All of these are promotional films I bought in the late seventies and early eighties – and it's still good material for recruitment, study – or just plain fun. Lots of very good archival material as well.

Any ideas?