The Physics of Sewing with Natalie Chanin

Chapter 1 - Overview

Overview of the physics of sewing

- For over a decade, I've been hand sewing and embroidering on a cotton jersey knit fabric with my company Alabama Chanin. So over the years, there's been a lot of tales and tricks coming through the sewing room, and we've come to learn that a lot of these old wives' tales actually find truth in physics. So this workshop is about those old wives' tales, how those old wives' tales find truth in physics, and how that can help you with your hand sewing of knit fabrics. (light bulbs buzzing)

Chapter 2 - Tips, Techniques and History

How cotton grows and making yarn

- So all of our work at Alabama Chanin actually starts with the cotton. And I always say that cotton is a little bit of a miracle. It's an actual living plant that grows in the field. Those of us here in the South are very accustomed to seeing it come up and grow all through the summer and into the fall. So, very late in the fall or late in the growing season, you'll see the white cotton ball that actually surrounds the seeds of the plant, and this ball, this white cotton that around it is actually a tiny little fiber that's kind of at the structure of all the fabrics that we use and the actual thread that we sew with. So, if you're able to look at cotton under a microscope, you'd see that the fiber looks like little squiggles. So, it's these little squiggles and the piling up of all these little individual fibers that actually gives cotton all of its properties. So, we say this is the physics of the cotton. Those little squiggles pile up and make kind of a soft cushion, which is why in the cotton jersey fabric that we wear, it feels so comfortable to our body. Also, because of all the piling up of those little squiggles, there's almost as much negative space as there is positive space, and this is what gives the cotton the ability to absorb water and to feel the cushion on your body. What happens is they remove the seeds from this little cotton ball, and they take those fibers and comb them into two rows, which become the basis of the yarn which knits the fabric and the thread that we use for sewing. So, they comb all those little squiggles into two rows. They twist one row one way, which is called an S twist. They twist the other row the other way, which is called a Z twist. And then they put these two rows together and twist them again. So, it's only through this property of tension and those two rows wanting to untwist that actually holds the yarn or the thread together. So, it's only this property of physics, torque and tension, this counter-twisting, that makes it possible for us to sew. And this is one of the reasons if you've ever tried to hem a pair of pants or sew on a button and your thread knots, it's only because of this excess tension through the actual physical process of making this tread that causes this problem in sewing, and we have a few tricks to help you alleviate these problems.

Needle your thread

- In our third book, Alabama Studio Sewing and Design, we collected some of these old wives' tales and tips to make it easier for people to remember them. On page 28 and 29, all the wives' tales and the physics are detailed here along with a story called the "Family of Stitches." One of the first old wives' tales is that you needle your thread, don't thread your needle. This makes perfect sense because if you look at this thread on a microscopic level, it's actually moving. It's a very weak element. The wind is blowing, as you talk, your breath makes this thread move back and forth. If you

look at the needle, it's the stronger of the two elements. It makes a lot more sense to actually move the needle than to move the thread. As you learn to sew, you always hear this saying, "Thread your needle," which means that you're actually moving the weaker of the two elements to try to get it through the eye of that needle. If you actually move the needle down over the top of the thread, hence, needle your thread. Pretty much every time you can get it threaded on that first try. Some of the garments that we sew can take one woman eight weeks to make. You can imagine how many needles have to be threaded (chuckles) to complete one garment. This can really save a lot of time and a lot of frustration as you're moving through the crafting process. The next tip that we come to is called, "Long Thread, Lazy Girl." The rule is that your thread should never be longer from your finger to your elbow. I usually cheat just a little (laughs) bit because we leave room for the knot at the bottom. We generally sew with a double layer of thread. You're going to have two strands of thread through the eye of the needle that come down around to the end of your elbow. There's actually several very important reasons for having this thread not be very long. There's an old German saying that says, "Long thread, lazy girl." (laughs) This actually finds its truth in physics because what happens is if you sew with a very long thread like this, through a property of ergonomics, you actually spend more time... If your thread is very long, you'll spend more time actually pulling your thread than physically sewing the garment. It actually winds up taking you longer to complete your garment when you sew with this very, very, very long thread. The next thing and a very, very, very important one, you remember back to the beginning that thread is made simply through a twisting action. The thread as it's made on this spool has a lot of excess twist in it. Especially as you move towards the center of the spool, you're going to find that there's actually much more twist on the thread at the center of the spool than at the outside edge. It doesn't seem like it would make a lot of difference in this very minuscule area but you have to remember that you're thinking in terms of microscopic actions. It's the very small things make a very big difference in the world of physics. What happens if you sew with a very long thread, you're actually going to have more excess twist in this thread and your thread's going to knot more easily. It makes it a lot easier to sew. Again, if you're sewing one of our garments that takes eight weeks to make and every time you take a stitch, you're thread is knotting, you're just gonna stop. I always say you're gonna throw it in the garbage can because you're just too bored of taking knots out of the work. The third and most important reason for this has to do with the physics at a microscopic level. If you look at this thread and the needle at a microscopic level as it's pulling through the fabric, what you would see is at this point that it's pulling through, there's extreme abrasion happening. If you could hear it and see it, you would see that little pieces of this cotton fiber are flying off of this thread that remember is only held together through a property of torque and tension. Little fibers are flying off everywhere. What happens since the needle is the carrier that essentially just makes a hole in the fabric for the two strands to move through, as you move up the thread, this point of the thread by the eye of the needle has suffered much more abrasion simply by the fact that it's been pulled through the fabric more times. What happens is the more often it's pulled through, the more weakened the thread becomes. If you sew with a very long thread, by the time you get up to the eye of the needle, this is severely distressed. Again, we're sewing by hand, stitch by stitch on this cotton jersey. What would happen is you throw it in the washing machine the first time and the thread is already stressed. It's really important that you sew with a thread of an appropriate length simply for the durability of the project that you're working on.

The end you cut

- Because of the manufacturing process and the way thread is wound onto the spool, there's a phenomenon that happens. When you cut the tread, the end that is cut away kind of splays, because you know the cotton, remember back at the beginning, cotton is just a little squiggle of a fiber, so as soon as this thread is cut, what happens is those little squiggles want to splay back out and take their original form. Right, the original physics of their structure. And so what happens is is that this cut end kind of splays, and this end that is still on the spool actually retains a point, and so if you're having trouble threading your needle, what you do is you just always thread this end that comes from the spool. And the end that you cut is the end that you're actually going to knot.

Love your thread
- So, we've needled our thread and we have a thread that's the right length for what, for our sewing purposes and you can see in the thread that there is this kind of excess tension that is, is there in the two strands that we have. So, we do this thing called loving your thread, which is going to remove the excess tension from the two strands. So, in traditional tailoring, for example, sometimes people will use beeswax to coat the thread so that it moves more smoothly through the fabric. In the way that we sew, because the fabrics are exposed afterwards, I don't like to use beeswax because I feel like there's a coating of wax on the thread that then becomes a residue on the fabric. So what we do is, you have natural oils in your finger that that you use to distribute over the, over the thread and you can see that the, that the tension in the thread, the excess tension starts to roll out of the thread. But we take it one step further. We say you have to talk to your thread as you're doing this action, and you have to tell that thread what it is that you want it to do. So, you say, this thread is going to sew the most beautiful garment that's ever been made. The person who's wearing it, it will bring them love or prosperity or joy or health or any of the things that you might want to wish to this person. And by the time you've perfectly loved your thread, you'll see that all the excess tension has been worked out of it. Your, your thread will never knot again. And, essentially, what you've done is you've trained, at the same time that you've released the excess tension from the thread, you've trained these two strands to act as twins. So essentially what you're doing is you're preparing them for the path of least resistance, again, the physics of it, this path of least resistance to move into the fabric and it, it helps remove the knotting because of the two strands don't twist over one another in the, in the sewing action, so, plus we like to think that you've sewn a lot of love into your project.

Family of stitches
- Cotton jersey is a knit fabric, so just like any knit fabric like if you think of a wooly sweater or like the structure of the knit, you realize that there's actually as much negative space as positive space in the knit. So if you hold the fabric up to the light, you can actually see the little holes in between the stitches of the knit. So if you look at page 28 of the book, there's an illustration there that shows this really at a microscopic level, where you can see the, remember the yarns that are only made through this twisting action, how they're knit together to make the structure of the fabric. A really important part of the work that we do at Alabama Chanin is that we try to make garments that are really heirloom pieces that are sustainable, that last forever. So what the thread that we sew with is this Coats & Clark Button Craft Thread. It's really what we have found to be the strongest thread on the planet. You cannot break it, and as a general rule, we sew with two strands of this very strong thread. Because we like to say that we're sewing for this generation and the next and the next and the next. So what happens at this microscopic level where you have this very fine little yarn that's

knit you know with these negative spaces around is that this very fine fabric has to hold the weight of this very strong thread. And so I have a little story that I always tell that helps people remember some of the physics of why we sew in the way that we sew. Some people need a tissue after the telling of this story. So my grandfather was this amazing man, and he lived not far from our studio here out in the country and when the kids would reach a certain age, he would take you out in the front yard and he would tell you to pick up as many sticks as you could hold in your two hands. So you would go around and you would pick up all these little twigs and you'd bring 'em back to him and you would lay them on the steps in front of the house. And he would take one stick and he would give it to you and he would say, okay break this stick. And of course you know a little twig like this you can very easily snap it, so you would snap the little twig and he would say, this is you, fragile, breakable. Then he would say now I want you to take as many sticks as you can hold and you would take all the sticks in your hands, and because of the physics of all the sticks together, the tensile strength of all of these twigs holding together, he would say okay now break it. It would be impossible for you to break, and he would say, this is your family, can't be broken. Right? And so the same is true with this cotton jersey fabric, this very fine beautiful fabric, and this very very very strong thread. So what happens is, as we are, as we are sewing, we sew with this double strand of thread, it's necessary to have a really big thick fat knot. So you have this knot that's sitting on the top of this very fine fabric, and so you have to tie a double knot to incorporate a family of stitches to support the weight of this very strong thread. So we tie a double knot. Everybody who sews in our way always says that this is one of the hardest things that we do. (laughing) It's actually very simple. It just takes a little bit of practice. So what I do is I make a very, just a simple loop, then I bring the ends of the threads through that loop. So we leave these long tails, 1/2 inch to 3/4 of an inch, because remember that this thread is only held together with tension, right, and so every time you wear or wash the garment, you're gonna lose little pieces of those fibers at a microscopic level, so over time this is gonna get shorter and shorter and shorter. And what you don't want to happen is for this to come down to the edge of the knot because what will happen is that the knot will come untied and you have trained through loving your thread, this thread to the path of least resistance to go through the fabric, and at the same time if you lose the knot, you've trained that thread to the path of least resistance to come out of the fabric. And we like to say again that we're sewing for this generation, the next, and the next, and the next. So what's really important at this point, we're going to tie a second thread, so we always sew with at least a double knot. I make the same loop again, pull the ends through, and the hard part is to get that second knot to land right on top of that first knot. I can do this because I've had a lot of practice, but if for some reason your knot doesn't land right on top of the first one, just tie a third knot, same way, you just make a loop, and normally that third knot will join those two knots together. And it's more important, it's really important to have a bigger knot than a smaller. What happens is if you have a little small knot, you're asking those very small little tiny fibers to support the weight of this knot, and what will happen is that it will pull through, and when it pulls through it will make a hole and it will, the seam will start to come out. So it's really important to have a bigger knot than a smaller knot.

Stitch lengths

- By the same token that we use these bigger knots for our thread, we also take slightly larger stitches than you generally would in hand sewing, so we try to keep our stitches between an eighth and a quarter of an inch. This is a, this is a bandana project from Alabama Stitch Book, our first book, and we're sewing right on this stencil line and we're gonna do the stenciling in another

workshop. So we just continue around the stenciled shape, taking stitches that are no smaller than an eighth of an inch and no larger than a quarter of an inch, all the way around. The reason that we take these stitches that are between an eighth and a quarter of an inch is that anything smaller than an eighth of an inch can pull through the fabric and make a little hole and you don't wanna have that with your finished projects.