Space Suits in Progress: Sewable Electronics

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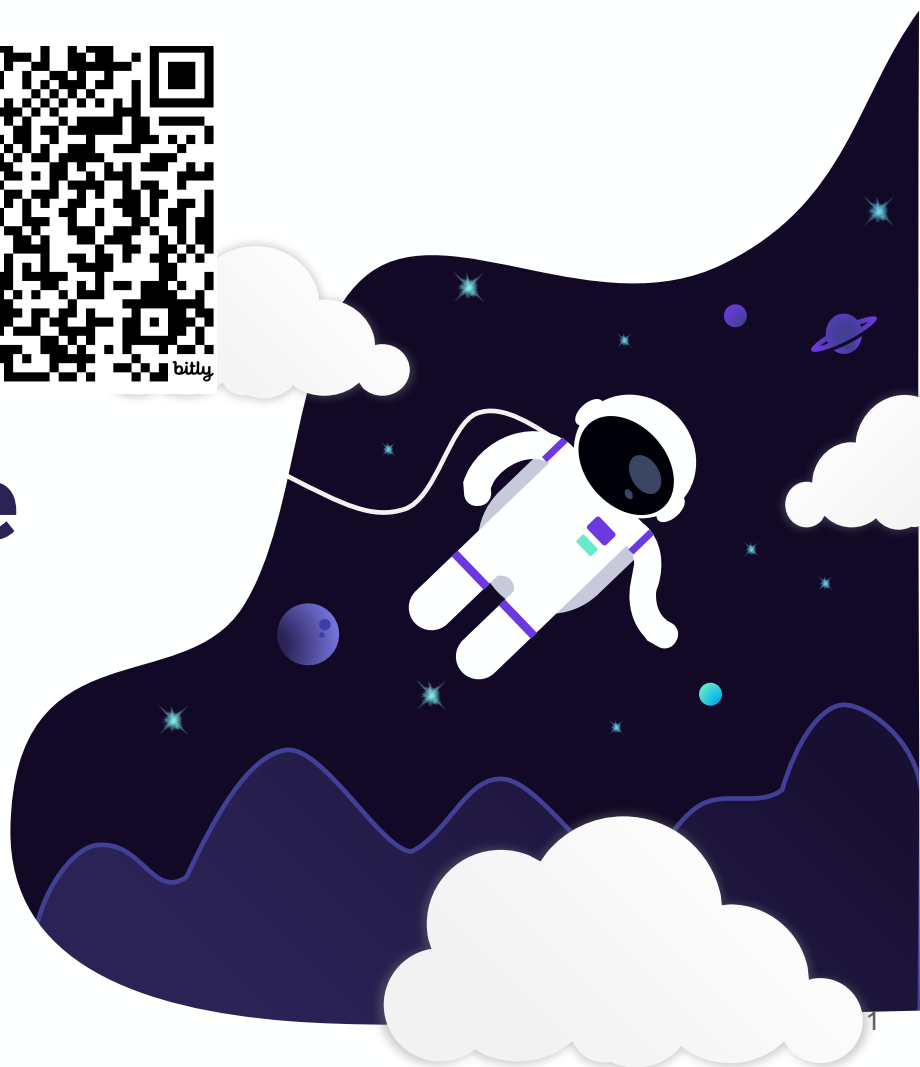

Think of **three words** that describe you or have special meaning to you. Write them down. We will use them later today.

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Agenda

- Welcome and Introductions
- Overview of the Session
- All about the Space Suit
- Make your Mission Patch
- Teaching Resources

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Meet your Facilitators

Barbara Liedahl
Professional Development Specialist
bjlfeltclaymaker@gmail.com
@feltclaymaker

- Recently retired public school educator
- Media Arts Instructional Specialist
- Music/fine arts educator
- Adjunct professor - Humanities
- Lives in Maryland
- Married 33 years
- Hobbies: paper crafting, sourdough bread-baking, jewelry making

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Meet your Facilitators

- Founder, STEAM4SPACE
- Space patch collector & curator
- Emblem historian & storyteller
- Space educator
- Space Hipster

Logan Jaeren

steam4space@gmail.com

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Learning Philosophy: Start with Wonder

At the heart of this session is creating a sense of **wonder**, the energizing feeling of **surprise** and **engagement** at encountering something new amongst the familiar — for example, a **scientific** phenomenon, captivating **artwork**, or in our case seeing a plain piece of fabric or other material come to life with **electricity**!

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What will I take home from this session?

- Your very own **Mission Patch!**
- **Resources** including templates, video tutorials, and example projects.
- The **technical skills** to support the sustained exploration of eTextiles.
- **Sample plans** for lessons and activities which you can customize for your learning context.

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Learning Philosophy: Make Connections

Interdisciplinary (STEAM) projects allow students to connect their **personal interests** to core content, and draw from their **existing knowledge** and skills as they develop **new skills** and understandings. Students are motivated to expand their **understanding** of electronics, as they develop expressive projects. They encounter unique **challenges** and develop their own **solutions**.

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Space Suits in Progress: Our Inspiration

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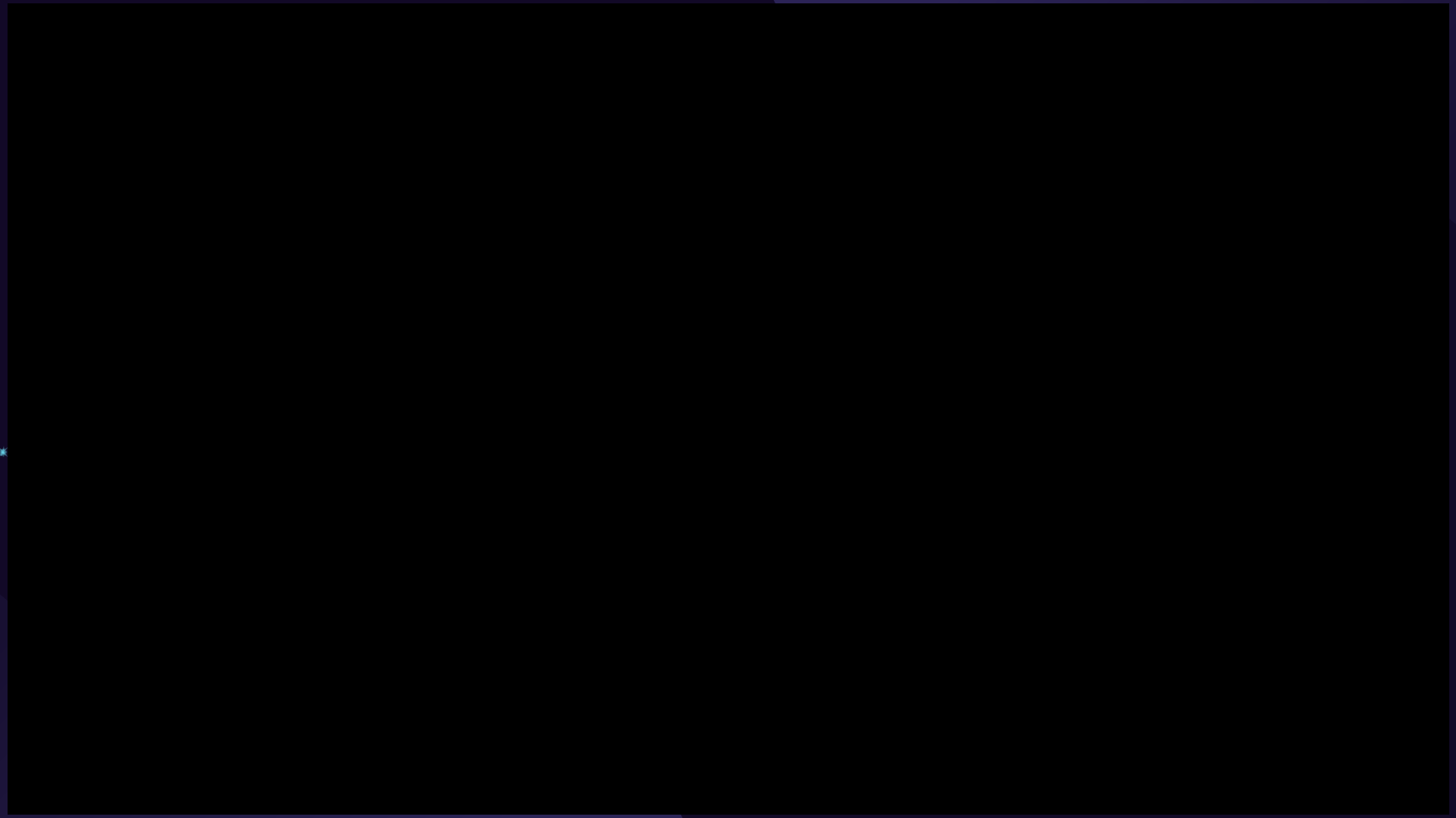

eTextile Women in Space

Hazel Fellows and the women who made the Apollo space suits. Article from Smithsonian.

Jean Wright - Article from Space.com - and her new children's book: "Sew Sister: The Untold Story of Jean Wright and NASA's Seamstresses" (Tilbury House Publishers, 2023) follows the story of how the space shuttle program was served by experts in threading needles and sewing machines. One of those experts was Jean Wright.

A detailed article about what the space suit is made of.

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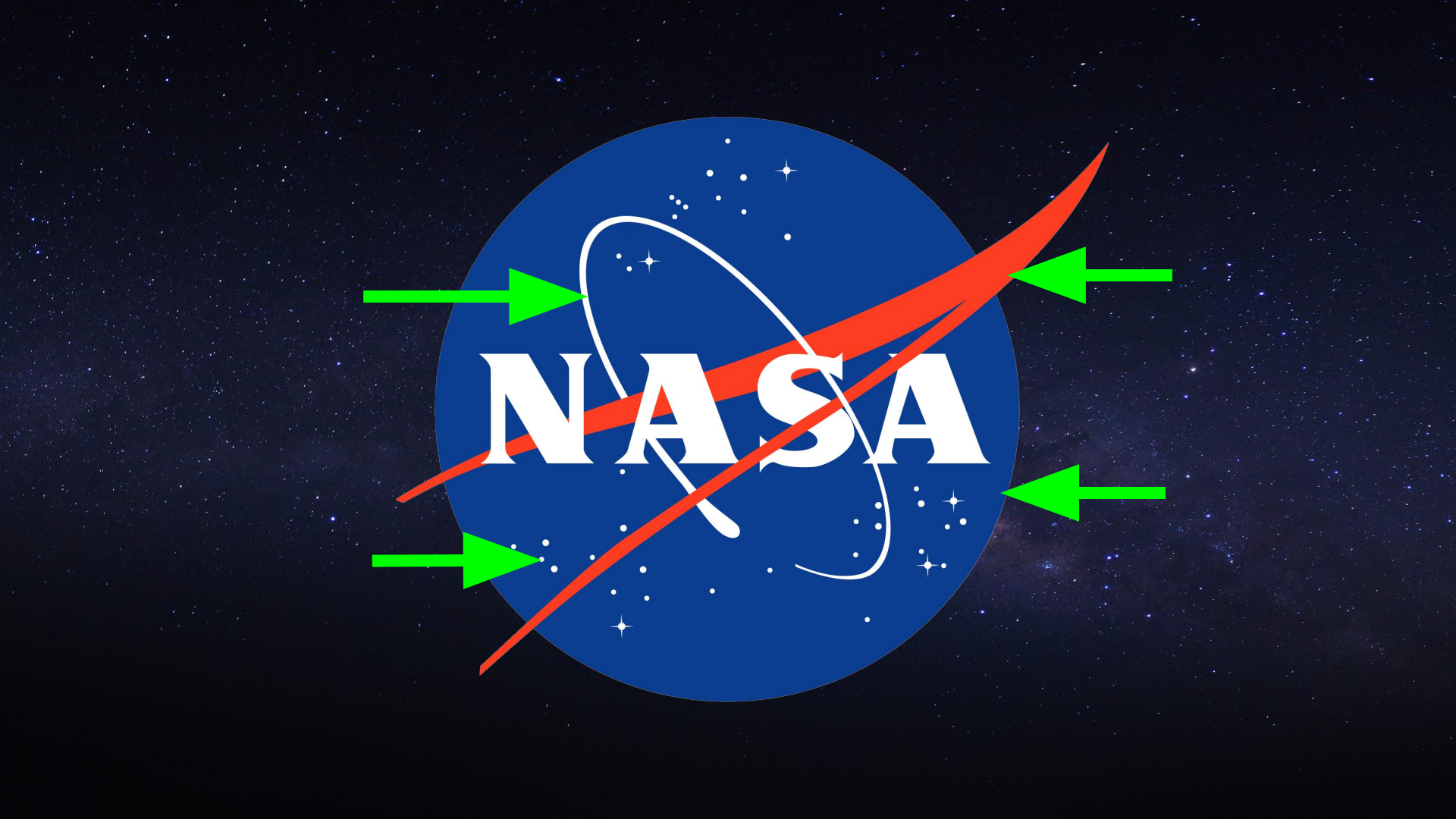
Recommended viewing:
Moon Machines - **The Space Suit**


NASA

First NASA mission patch flown in space

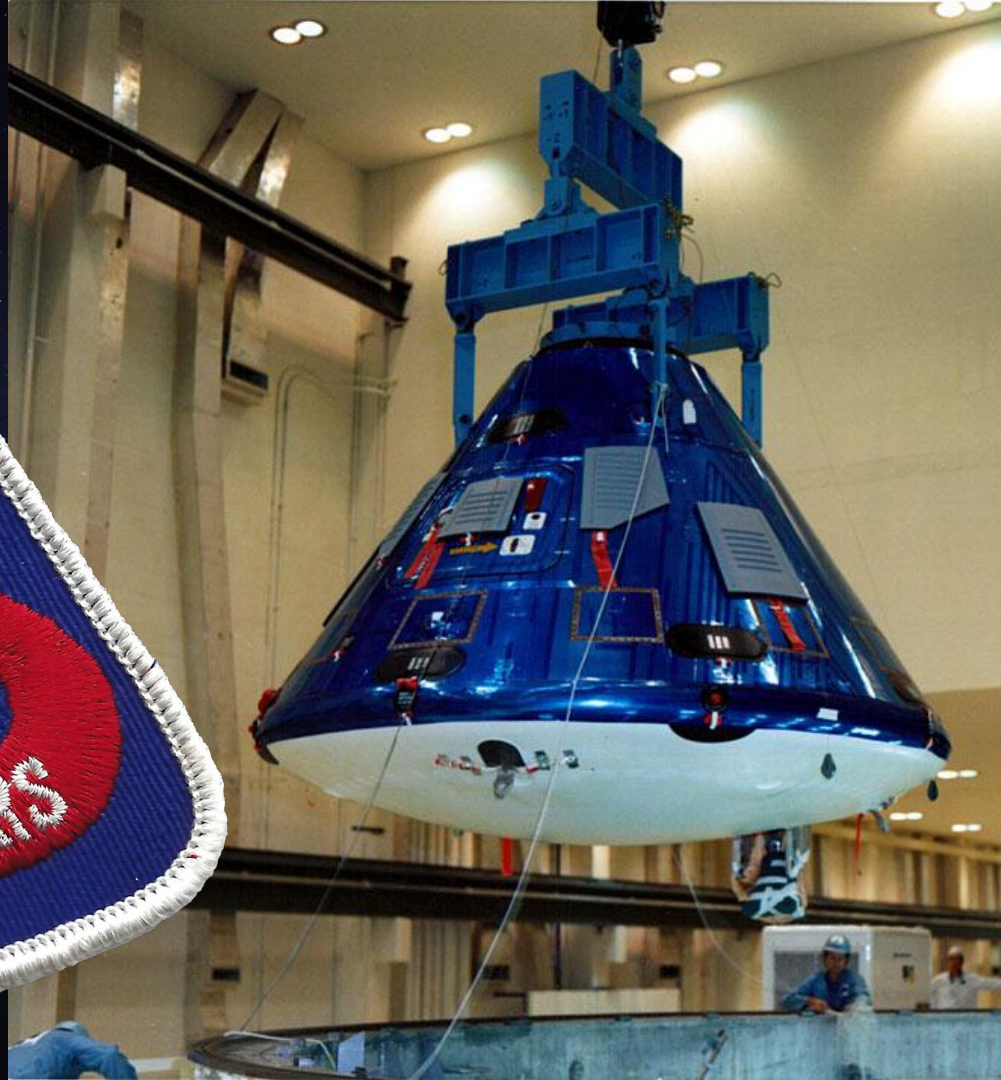
Gordon Cooper

Pete Conrad

21 August 1965

Apollo 14

Apollo 8



Columbia
STS-1 (1981)

Discovery
STS-41D
(1984)

Endeavour
STS-49 (1992)

Challenger
STS-6 (1983)

Atlantis
STS-51J (1985)

STS-41D
(STS-12)


MUSGRAVE COVEY BOWERSOX AKERS
NICOLLIER
TANNER McMONAGLE BROWN
HIEB VEACH
GUTIERREZ CHILTON GODWIN
CLIFFORD APT SAL-1 JONES
SEGA CHILTON SEARFOSS LUCID
CLIFFORD GODWIN
BARAZYNSKI WETHERBEE BLOOMFIELD CHRETIEN
LAWRENCE FOALE
WALKER
NEWMAN GERNHARDT VOSS
DURRANCE
HELMS
WISOFF
VOSS CRADE DUFFY

Stars

STS-7

STS-129

STS-36

Stars

STS-42

STS-27

STS-78

Shapes

Shapes

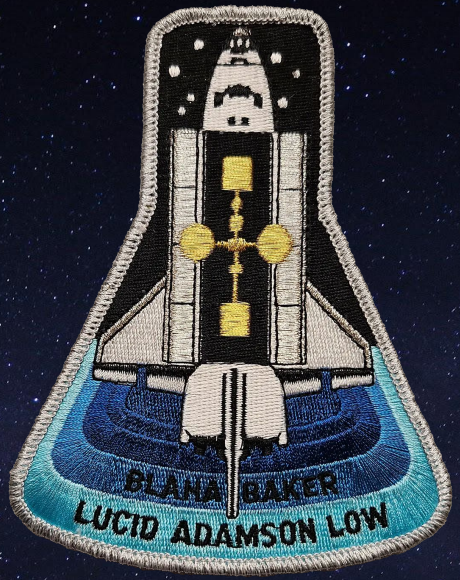
Shape

STS-4

STS-5

STS-6

Shape



STS-43

Expedition 66

STS-58

Icons

Sun

Mercury

Venus

Earth

Moon

Mars

Asteroid Belt

Jupiter

Saturn

Uranus

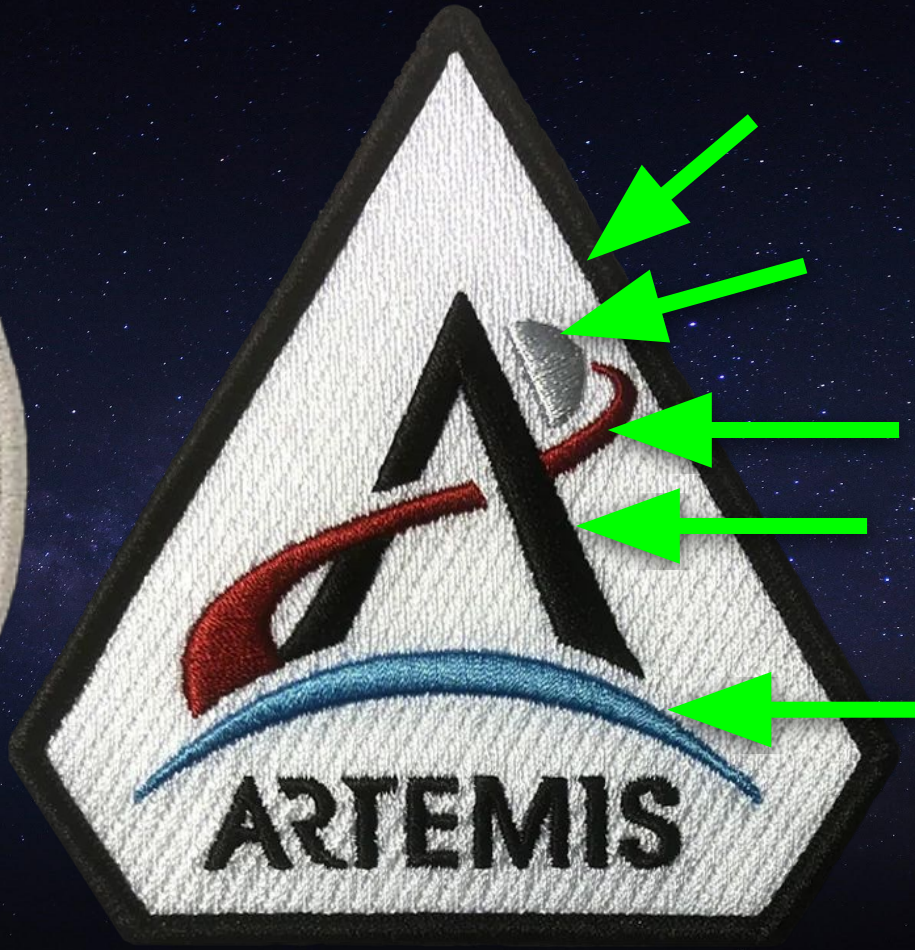
Neptune

Pluto

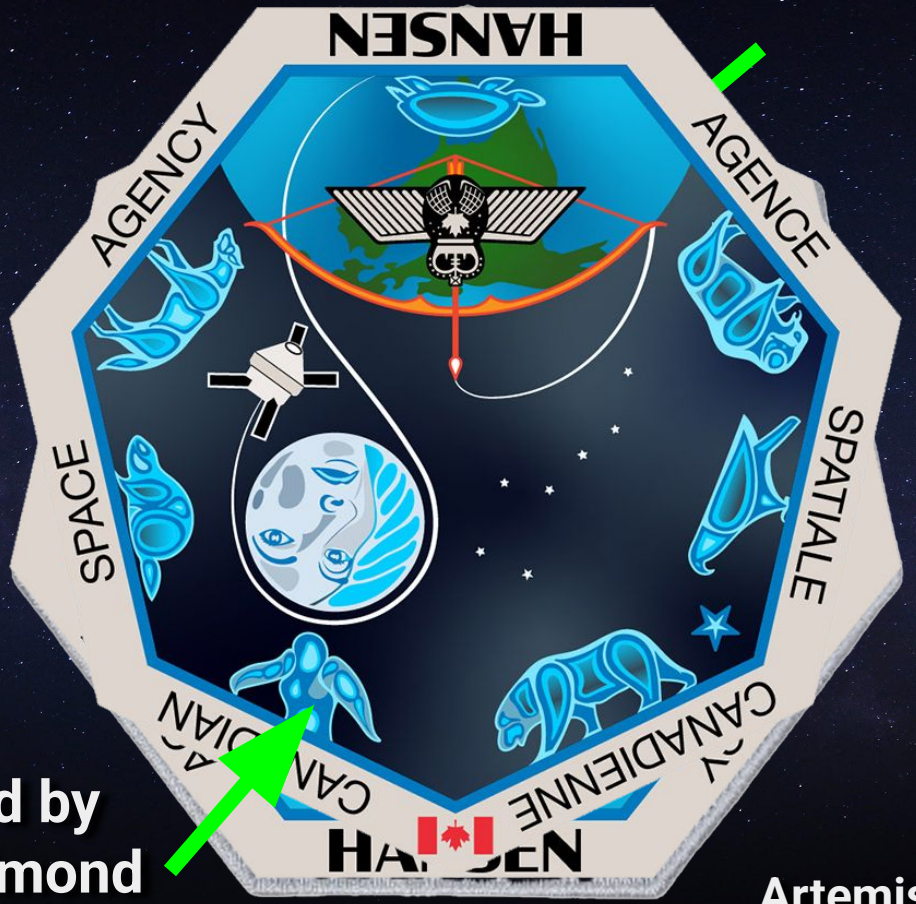
Kuiper Belt


PROJECT VIKING
MISSION TO MARS


APOLLO
NASA


ARTEMIS

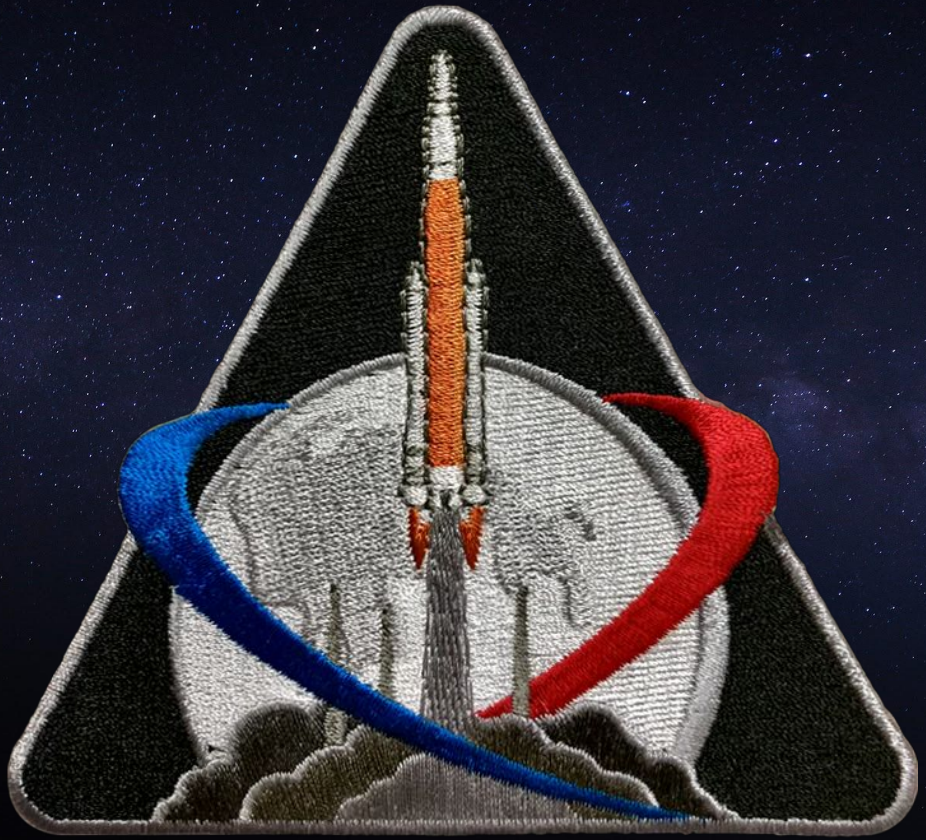
Jeremy Hansen



Designed by
Henry Guimond

Artemis II

Artemis I



Artemis II

Artemis II

Back Side

Attributes of a good design:

- It’s personal to the crew.
- Represents the mission.
- It supports a well crafted story.
- See something new with each view.
- Details hidden in plain sight.
- Open to interpretation.
- Color and shape are meaningful.

Patch Define Worksheet

Start by defining a **personal patch** (on the next page); a patch design that best represents you as an individual. Use this worksheet to design your personal patch, or If you are designing a team patch, share your personal patch design ideas with your team, then collaborate on a patch design that best represents you, your crew, and the goal of your mission.

The story of your crew patch design should include the following.

1. Your primary mission goal.
2. Your mission designation. A set of letters and numbers to represent the mission. The letters could represent a space program name, a spacecraft name, school name, crew initials, an acronym or something else. The number could represent the mission number, a year or something else. Example mission designations: Raven 1, Wolf 359, FMS-25, JSMS 2026
3. The name of your spacecraft, space station or habitat.
4. The nickname or callsign of your crew. Give your crew a humorous nickname; the name is meant to be playful, referencing something unique or memorable about the group.
   Examples of actual astronaut candidate group names are: The Mercury Seven, The Hairballs, The Turtles, The Peacocks, The Hogs, The 8-Balls, The Flying Escargot, The Flies, etc.

Consider the following when designing your personal patch and crew patch.

- A patch shape that is meaningful and/or supports your design.
- Spacecraft / habitat name.
- Mission designation.
- A symbol or phrase that reflects your mission.
- Last names of the crew.
- An astronaut symbol.
- A symbol of something you enjoy doing, like a hobby or sport.
- An element, shape or icon that feels important to you.
- Stars to represent you, your crew or people you want to acknowledge or remember.
- Names of important people that you want to acknowledge.
- Planets or other objects you may encounter on your journey.
- Colors that represent your nationality or personal preference.
- Flag of your country.
- A quote representing the spirit of your mission.

STEAM 4 SPACE™

- FREE mission patches
- STEAM lesson plans
- Patch design activities
- Patch shape stencils

and more at...

STEAM4SPACE.org

Link to these slides:
https://bit.ly/eTextilesSEEC26

Student Mission Patch Designs

Students designed their Mission patches based on these prompts:

Where are you going?
What is your place in SPACE?

Student Team Mission Patches For High Altitude Balloon Launches

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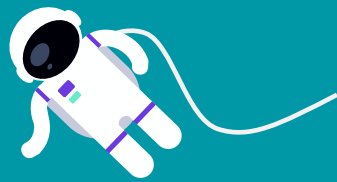
Think of **three words** that describe you or have special meaning to you. Write them down. We will use them later today.



Link to these slides:
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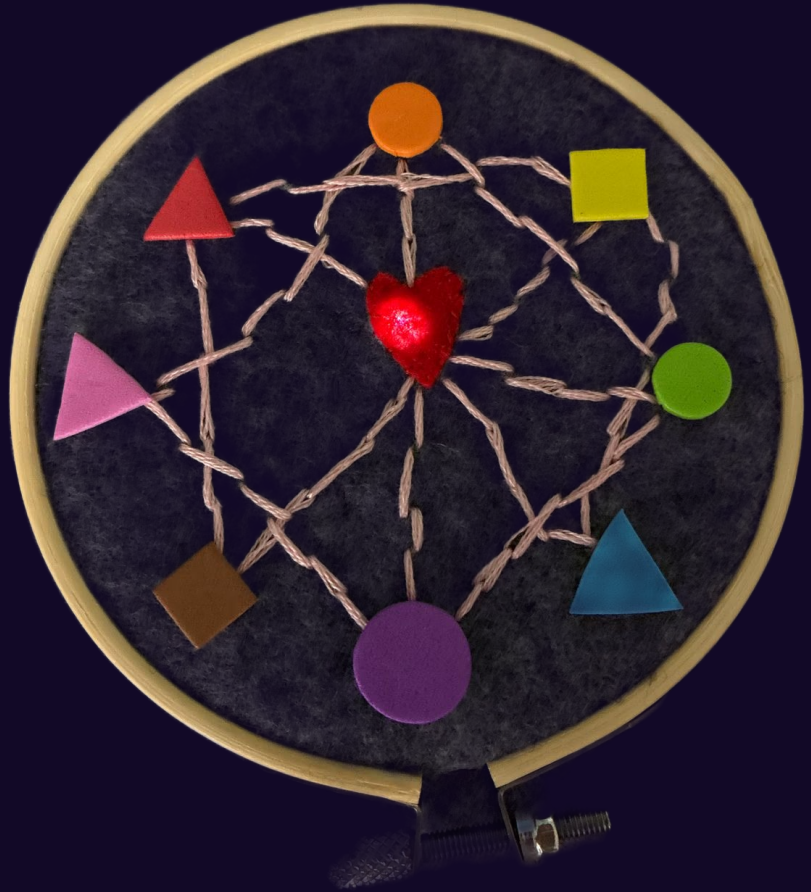
Julie

Completed 2025 patch with 22 gold stars, one for each year I have taught in public schools. Sewn with the rainbow broken apart by Sir Issac Newton's prism and Opticks. It's also an homage to Pink Floyd's Dark Side of the Moon and an indication of safety for those in need.

Heather

My mission patch represents time as it changes and my family. The tree is changing through the season just as our lives do. Nothing is more evident of this than one’s ever changing family. I used apples because I'm a teacher. The red apples are my children and the green one represents my husband. It's on orange to represent the sun with a bright future. The orange circle is imperfect to show the future is not perfect either but we'll get there.



Mandy

I love to connect myself with others and to connect others to each other. I also love to connect seemingly unrelated topics together (like sewing and space exploration).

Taylor

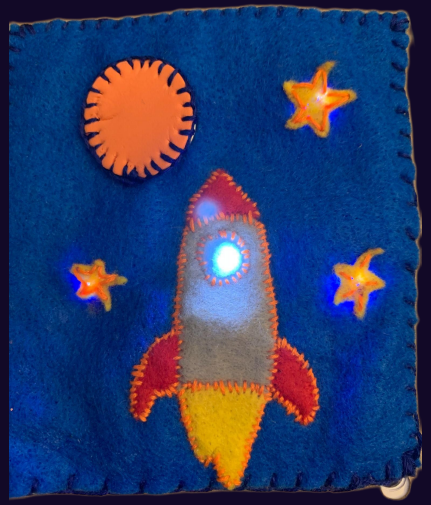
I made my mission patch in honor of my dad, who passed a couple of years ago. He was the first person who got me interested in space science. I grew up in Florida and we would watch rocket launches from our driveway together. The three waves represent his love of surfing and the three daughters he left behind. The mountains represent where I live now, which is Colorado. I used red for the sky because it's symbolic of love. The black circle is the new moon, which is the phase the moon was in the night he died (and also the phase the moon was in the night I was born!). The glowing star represents my dad's spiritual ascension into a celestial body and the hope that he is looking down on my sisters and I. :)

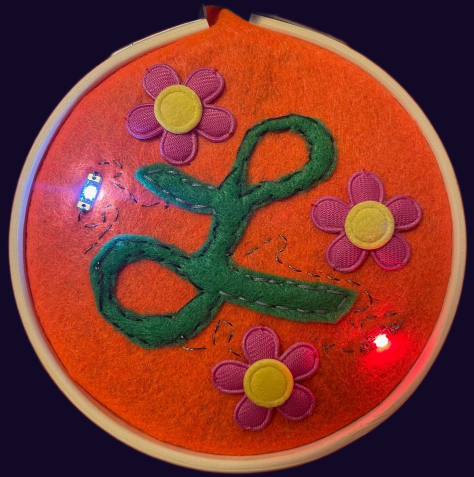
Sierra

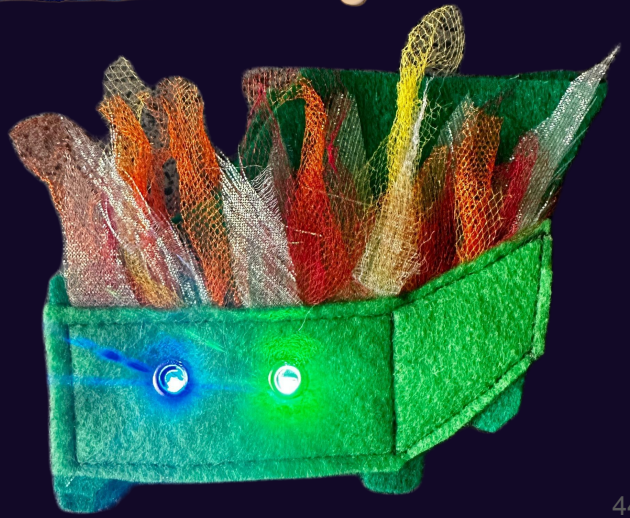
I chose hearts to represent each member of my family. The buttons and beads were picked out by my kiddos who helped me decorate. I will use this project in an elementary and middle school population, so I wanted to make sure I could see any potential issues that could be encountered with little hands.

Jennifer

This mission patch represents my role as an educator and STEM Facilitator in New Mexico (The Land of Enchantment). The light blue background reflects New Mexico's skies, while the yellow, maroon, and white are the school district's colors. The eagle, the district mascot, symbolizes our collective strength and vision for student success. The rocket ship signifies adventure and the hands-on learning/exploration provided by our STEM programs. The 22 stars represent my years in education. I used borrowed conductive thread to create this patch, finding the process relaxing and a unique way to share my story with students and teachers.







Create Your Mission Patch

Link to these slides:
https://bit.ly/eTextilesSEEC26

Things to consider before creating your own Mission Patch...

- Go back to the three words you wrote down earlier.
- What symbols might represent those words?
- Can those symbols be represented in your mission patch?
- Sketch your layout on paper first, then transfer to your felt.

Link to these slides:
https://bit.ly/eTextilesSEEC26

Let’s Make Your Mission Patch

Source: **Glowing Pin Tutorial**

Materials:

- Felt
- One of the sewable LEDs
- Coin-Cell Battery
- Scissors
- Conductive Thread
- Sewing Needle
- Glue or sewing thread
- Safety Pin

Step - by - Step

1. Design your patch and draw it lightly on your felt. Decide where you want your LED.
2. Sew your circuit according to the directions on the tutorial. Test the circuit by inserting the battery. Troubleshoot.
3. Decorate the front of your patch according to your design.
4. Attach the safety pin and wear proudly!

Learn more about e-Sewing **HERE**.

eTextile Pin Tutorial

Where Can I Get Materials?

https://bit.ly/eTextilesList

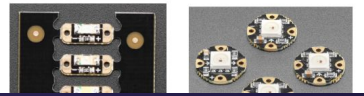
Link to these slides: https://bit.ly/eTextilesSEEC26

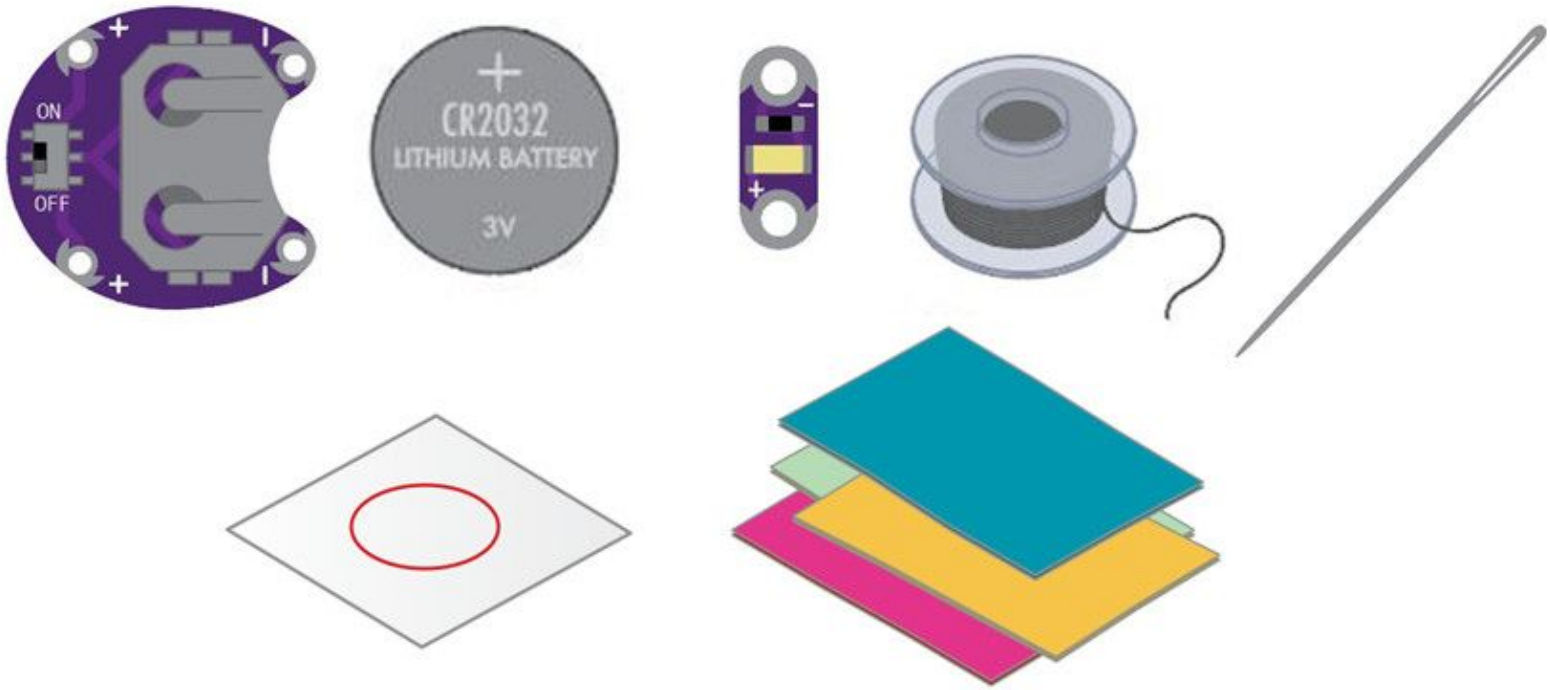
SLIDESMANIA.COM

eTextiles Materials List and Prices

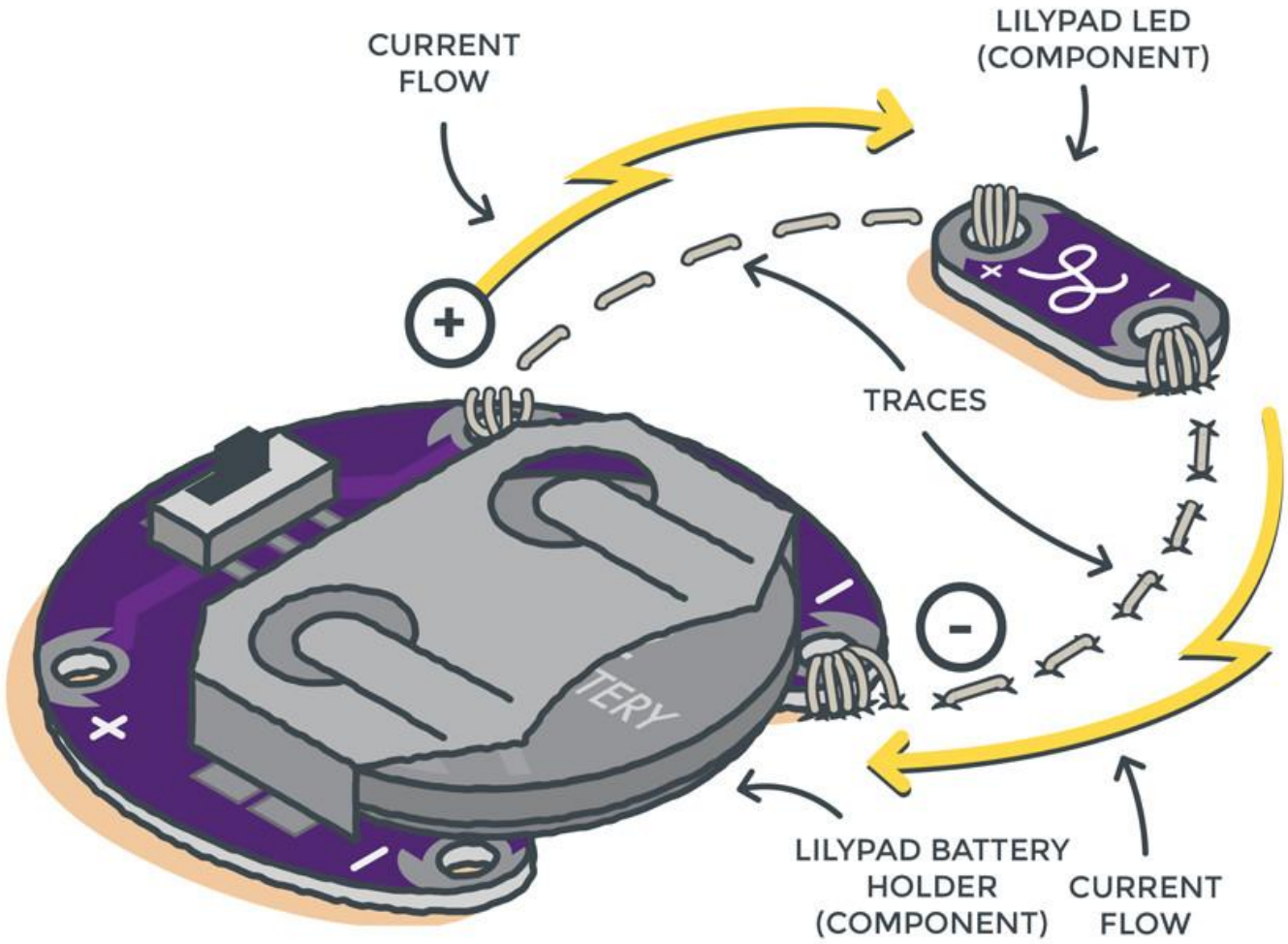
Prices as of 02/05/2026 - bjlfeltlaymaker@gmail.com

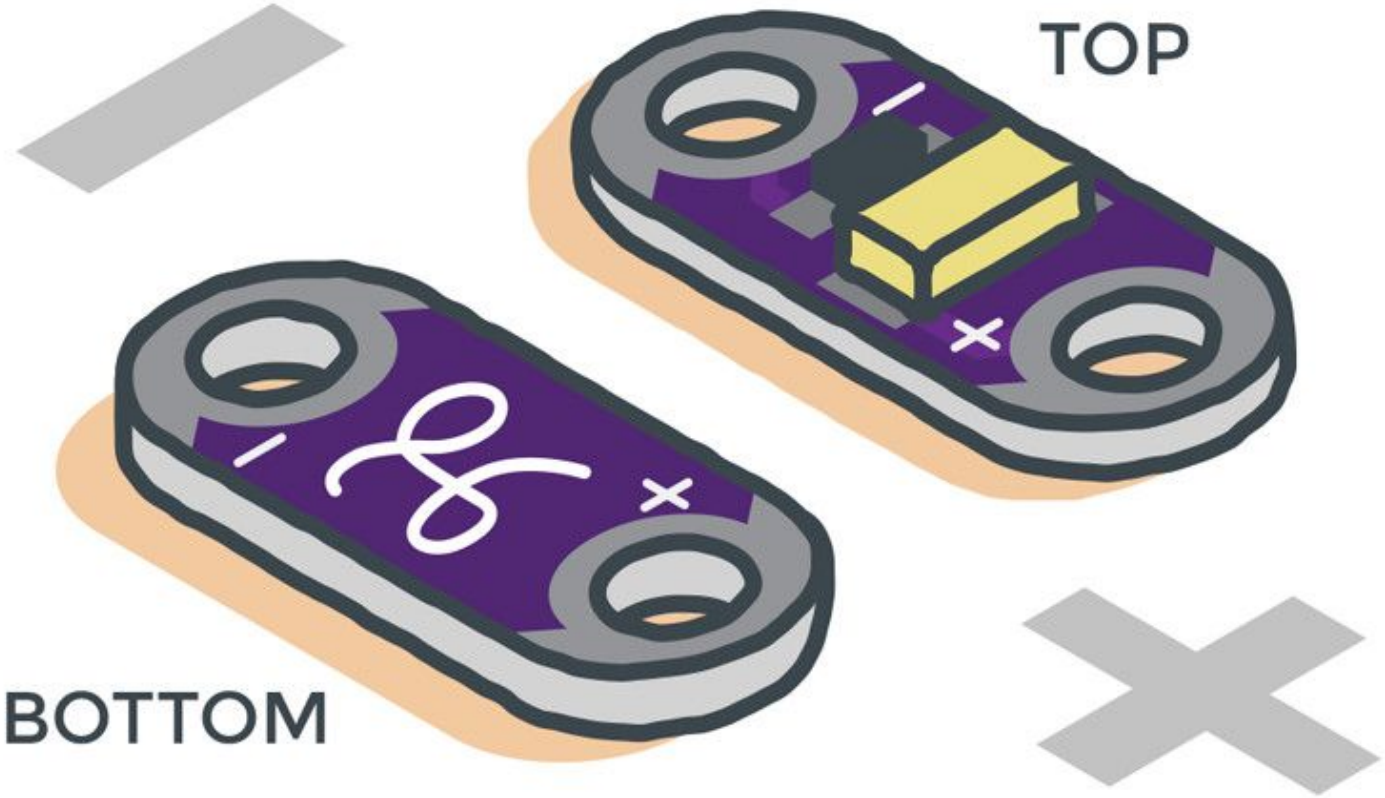
DonorsChoose

Item with Link	Image
Conductive Thread • Adafruit 76 Feet $6.95 • SparkFun Bobbin 30 Feet $5.75 • SparkFun Huge Roll 360 Yards $82.75 • DigiKey 35 Feet $4.50	
3mm Through-Hole LEDs • Amazon - $14.99 for 1000 (5 colors) • Adafruit - $2.95 (25) **IMPORTANT!** If you use different colors in the same project, you will either need resistors to regulate the flow of electricity or use only warm colors (red, orange, yellow) or only cool colors (white, blue). Green sometimes works with either cool or warm, depending on its makeup. Read more about LEDs and Ohm's Law HERE and SparkFun's page HERE.	
Sewable LEDs Adafruit LED Sequins: Multicolor $3.95 for 5 (tiny sewing holes) Adafruit Neopixels - $6.50 for 4 (needs	

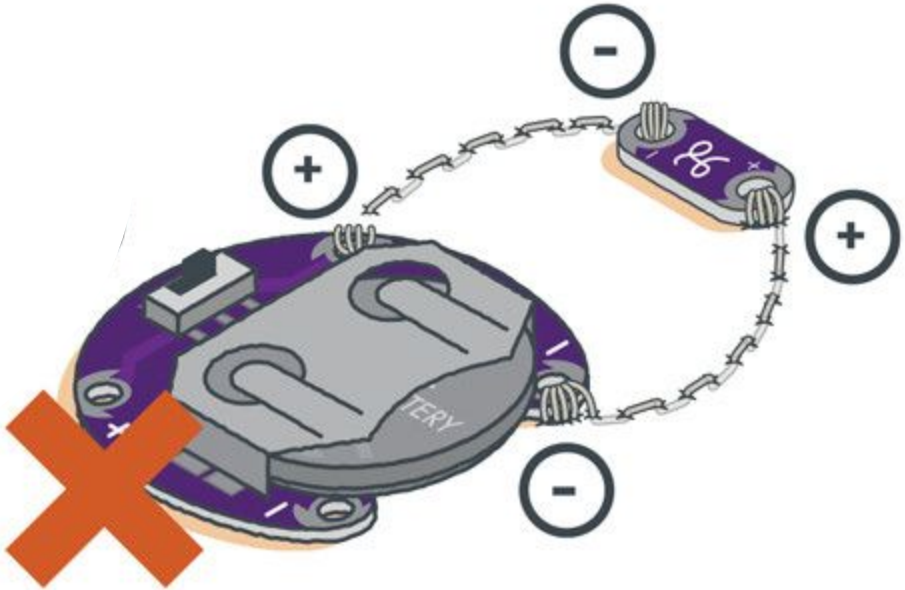

ON
OFF
CR2032
LITHIUM BATTERY
3V

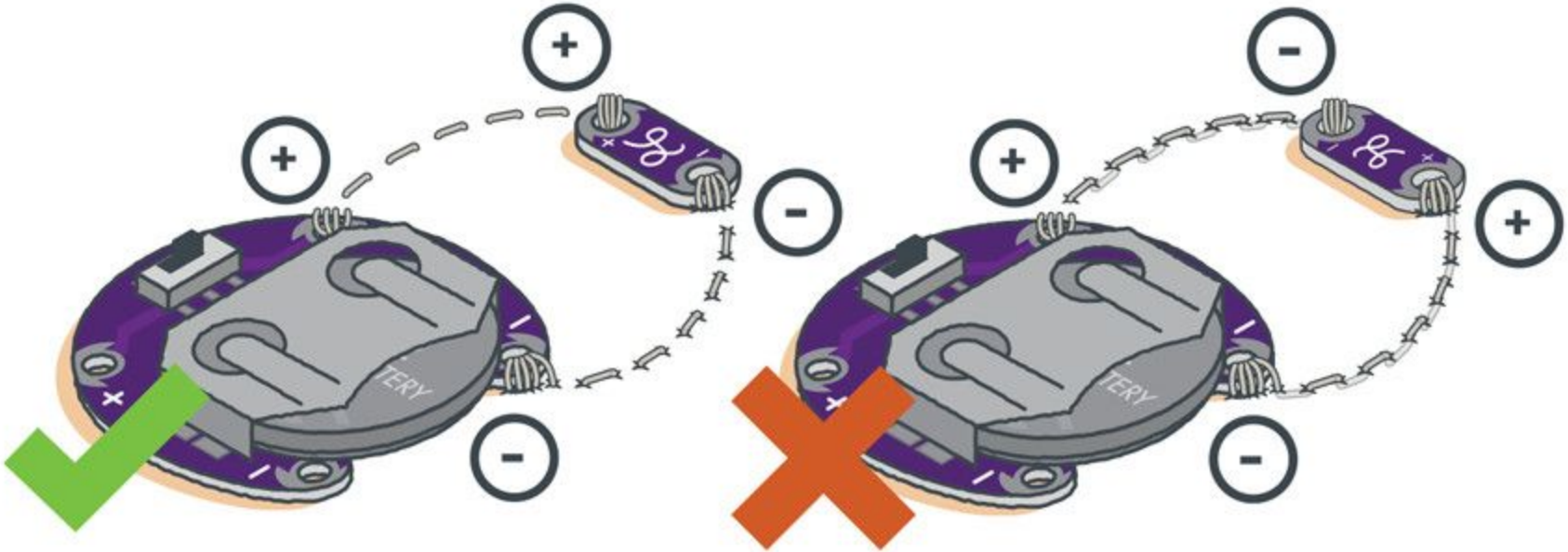

ON
OFF


CURRENT
FLOW
LILYPAD LED
(COMPONENT)
TRACES
LILYPAD BATTERY
HOLDER
(COMPONENT)
CURRENT
FLOW


TOP
BOTTOM

What is wrong with this circuit?




+
+
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TERY

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Learn more about e-Sewing **HERE**.

Some Resources for eTextiles

Glowing Pin Tutorial from SparkFun

Electronic Sewing Basics

Printable Design Worksheet

Printable Patch Designs

Felt Wristband Tutorial - uses bulb LEDs

Barb's Instructables Felt Wristband Tutorial

Stitching the Loop Curriculum

Sew Electric Projects

Soft Circuits - Workshop Guide

Astroskin: Bio-Monitor in Space

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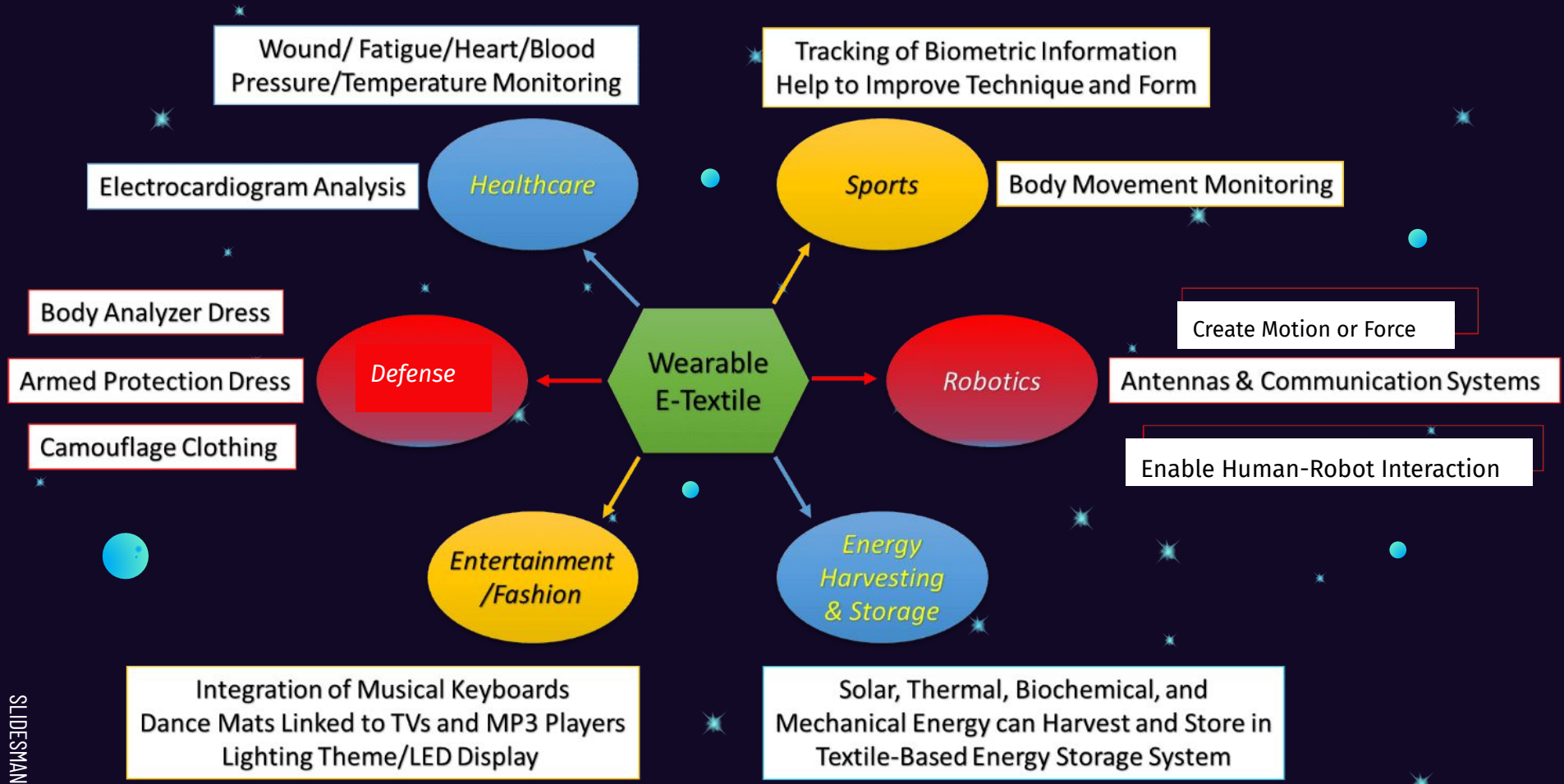

Source: https://atira.in/elevating-clothing-to-a-whole-new-level-with-e-textiles/

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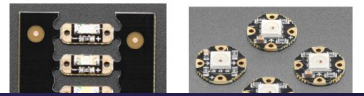
Sewable LEDs Adafruit LED Sequins: Multicolor $3.95 for 5 (tiny sewing holes) Adafruit Neopixels - $6.50 for 4 (needs	

Infosys Pathfinders Online Summer Institute (link)

1. Create an account
2. Check back Mid-March for Summer Opportunities
3. See next slide for info about **Space Suits in Progress: Sewable Electronics**

Thank You!

Barbara Liedahl
Professional Development Specialist
bjlfeltclaymaker@gmail.com

Logan Jaeren
Founder, STEAM4SPACE
steam4space@gmail.com

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Thank you!

Credits

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