

The background of the slide is a light gray gradient. It is decorated with numerous realistic water droplets of various sizes. Some droplets are at the top, some at the bottom, and some are clustered together. They have highlights and shadows that give them a three-dimensional appearance.

3-D PRINTING FOR LENSES AND FRAMES

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thank you for being with us this year.**


Vision Expo Has Gone Green!

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Conference Advisory Board considers content and speakers for future meetings to provide you with the best education possible.






WHAT MAKES A PRESCRIPTION IN A LENS?

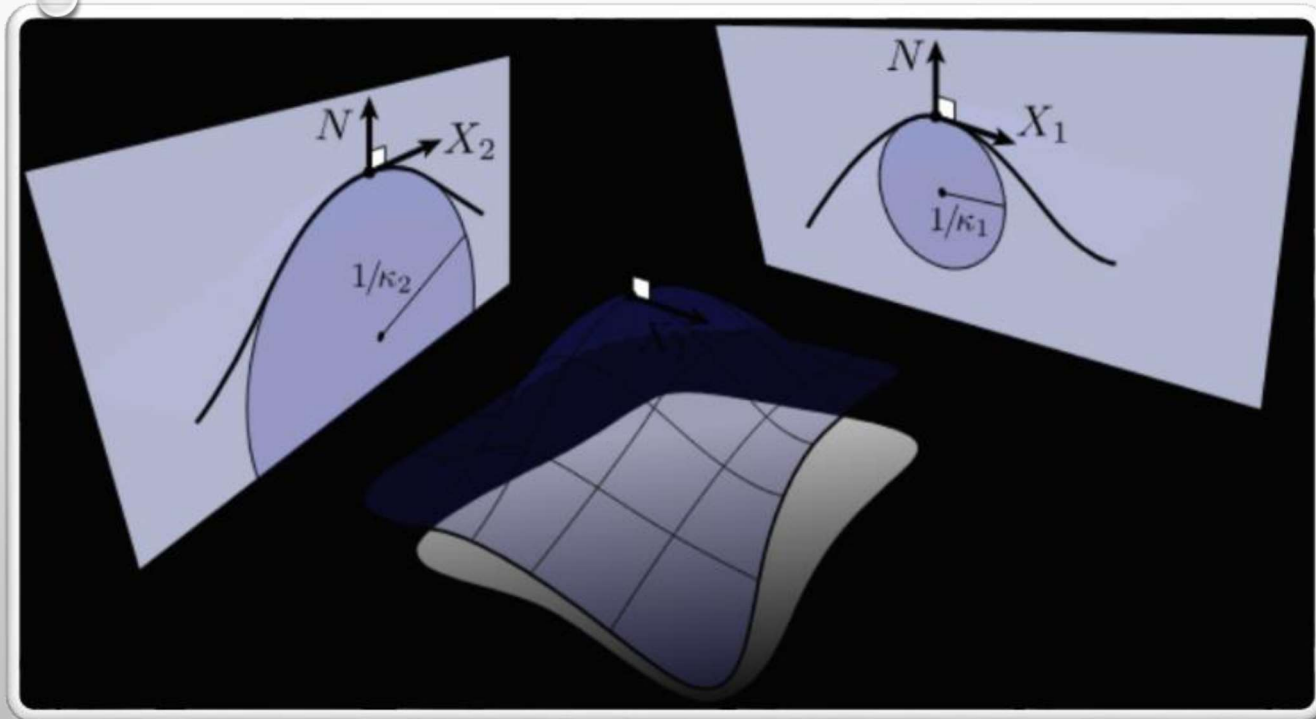
- CURVATURE
 - THICKNESS
 - INDEX OF REFRACTION
- 





WHAT MAKES A PRESCRIPTION IN A LENS?

- CURVATURE
 - THICKNESS
 - INDEX OF REFRACTION
- 



CURVATURE

- THE STEEPER THE CURVE, THE STRONGER THE POWER
- THE FLATTER THE CURVE, THE WEAKER THE POWER

THICKNESS

- THE THICKER THE LENS, THE STRONGER THE POWER
- THE THINNER THE LENS, THE WEAKER THE POWER



INDEX OF REFRACTION

The Lens Maker's equation is

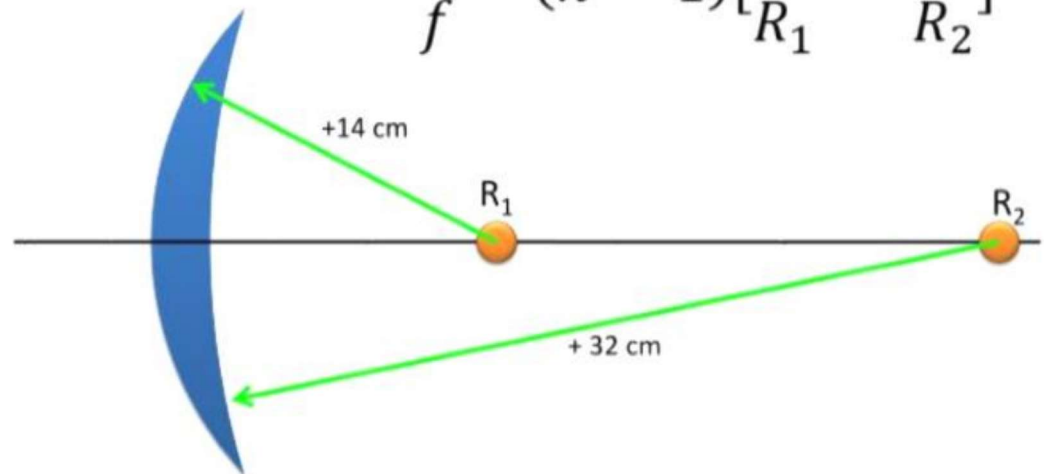
$$\frac{1}{f} = (n - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} + \frac{(n - 1)d}{n R_1 R_2} \right),$$

LENS MAKER'S EQUATION

physics 139 - Physics for Optometrists

Lens Maker's Equation

$$\frac{1}{f} = (n - 1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$$





MR. CURVATURE
MR. THICKNESS
MR. INDEX OF
REFRACTION

TRADITIONAL METHODS OF MANUFACTURE

- TRADITIONALLY, A LENS BLANK IS CREATED IN A LARGE MANUFACTURING PLANT. THE BLANK IS SHIPPED TO THE OPHTHALMIC LAB WHERE IT IS STOCKED UNTIL REQUIRED. WHEN A CERTAIN LENS PRESCRIPTION IS PRESCRIBED FOR A PATIENT, THE APPROPRIATE BLANK IS SELECTED FROM A LARGE INVENTORY OF BLANKS AND THE FINISHING PROCESS BEGINS. EXCESS MATERIALS ARE CUT AWAY IN SEVERAL STEPS, TO CREATE THE FINAL SHAPE AND THE RESULTING LENS IS POLISHED TO OBTAIN A SMOOTH SURFACE. THE PROCESS REQUIRES MANY MANUAL HANDLING STEPS AND MORE THAN 10 MACHINE PROCESSING STEPS.



SUBTRACTIVE MANUFACTURING

- AROUND 80% OF ORIGINAL MATERIALS ARE WASTED IN THE CUTTING (GRINDING) PROCESS.
 - SUBTRACTIVE MANUFACTURING RESULTS IN STOCKPILES OF INVENTORY AND LOW YIELD.
- 



ADDITIVE MANUFACTURING

- IN CONTRAST TO SUBTRACTIVE MANUFACTURING TECHNOLOGIES, A MATERIAL IS ADDED TO CREATE A LENS. 3D PRINTING REDUCES INDUSTRY EXPENSES BY COMBINING EFFICIENCY AND FLEXIBILITY IN THE PRODUCTION FLOW.
 - SUBTRACTIVE MANUFACTURING TECHNOLOGY CAN NOW BE REPLACED WITH A SINGLE STEP: 3D PRINTING THE OPHTHALMIC LENS.
- 



3D PRINTING IN ACTION

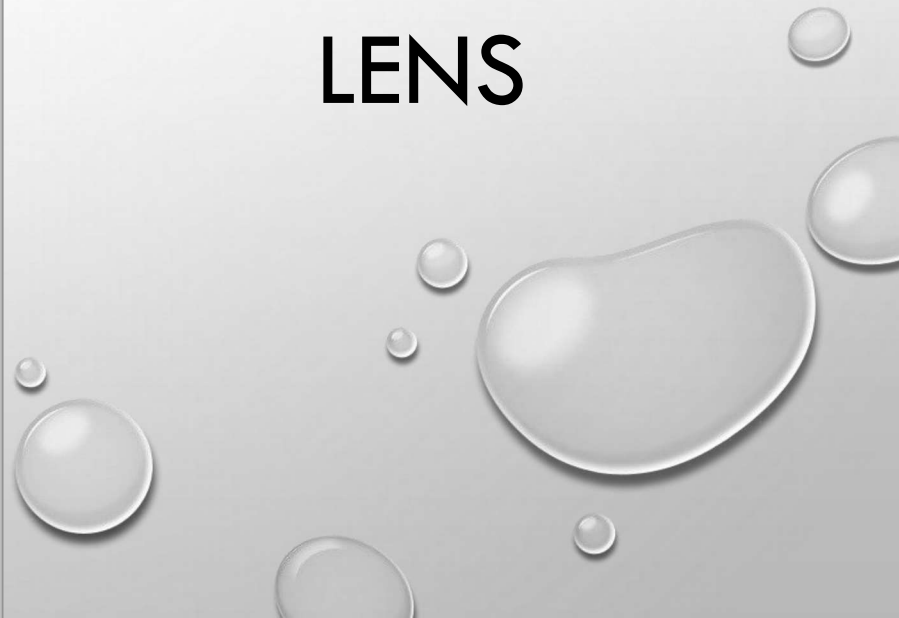
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Luxexcel®

3D printed lenses



LENTICULAR LENS






'INK' DROPLETS FOR LENSES

- SIMILAR TO PLASTIC MONOMER, THE 'INK' FOR 3D LENSES HAS SPECIFIC OPTICAL PROPERTIES:
 - INDEX OF REFRACTION
 - ABBE VALUE
 - SPECIFIC GRAVITY
- 



'INK' MATERIAL PROPERTIES

- INDEX OF REFRACTION: 1.5225
 - ABBE VALUE: 45
 - SPECIFIC GRAVITY (WEIGHT): 1.15 G/CM³
- 




‘INK’ MATERIAL PROPERTIES

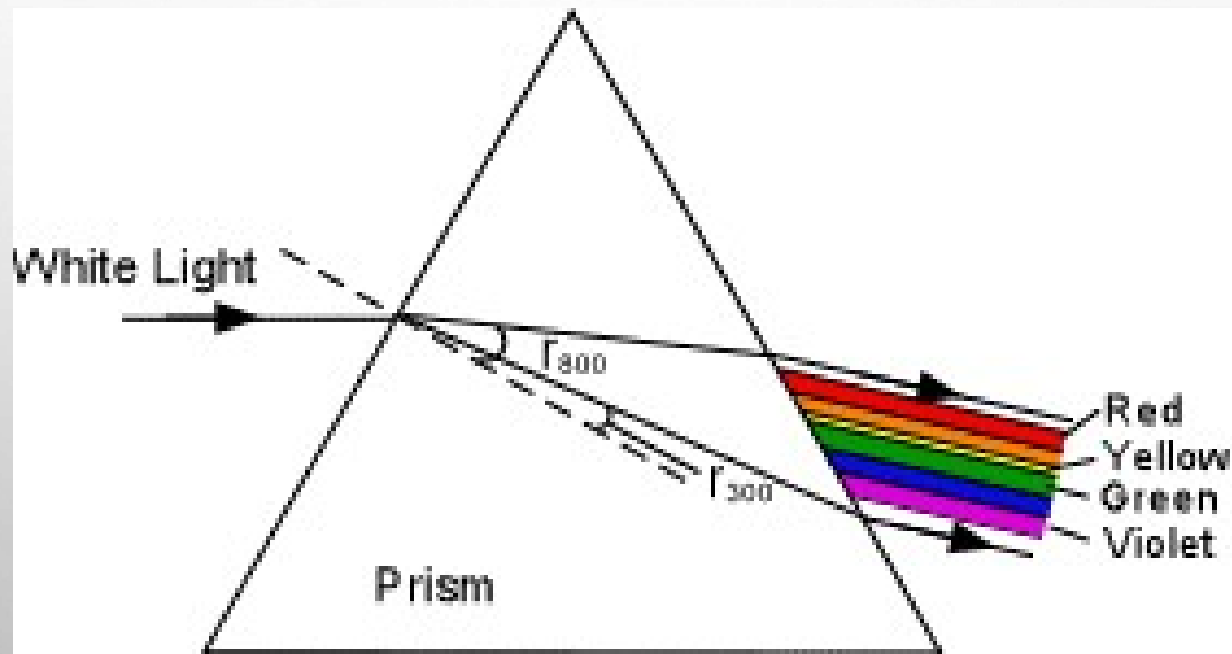
- **INDEX OF REFRACTION: 1.5225**
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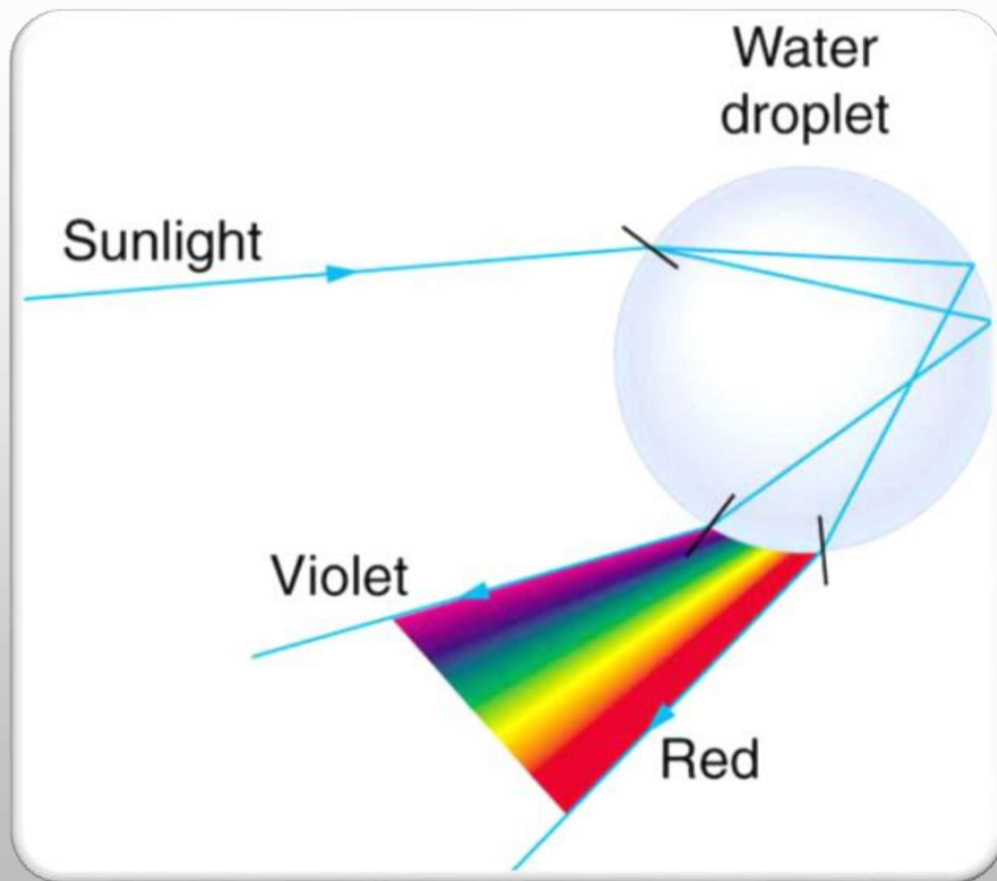


'INK' MATERIAL PROPERTIES

- ABBE VALUE: 45
 - ABBE VALUE TELLS US HOW MUCH DISPERSION IS INHERENT IN A LENS.
 - THE GREATER THE DISPERSION, THE LOWER THE ABBE VALUE
 - LOW ABBE VALUES RESULT IN UNWANTED CHROMATIC ABERRATION
- 

DISPERSION OF LIGHT THROUGH A LENS






DISPERSION OF LIGHT THROUGH A DROPLET



'INK' MATERIAL PROPERTIES

- ISO POWER: COMPLIANT WITH ISO 8980-1:2004 FOCAL POWER
 - TESTED BY COLTS LAB (REPORT AVAILABLE UPON REQUEST)
 - DROP BALL: PASSED
- 

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TINTED LENSES/PHOTOCHROMIC CAPABILITIES

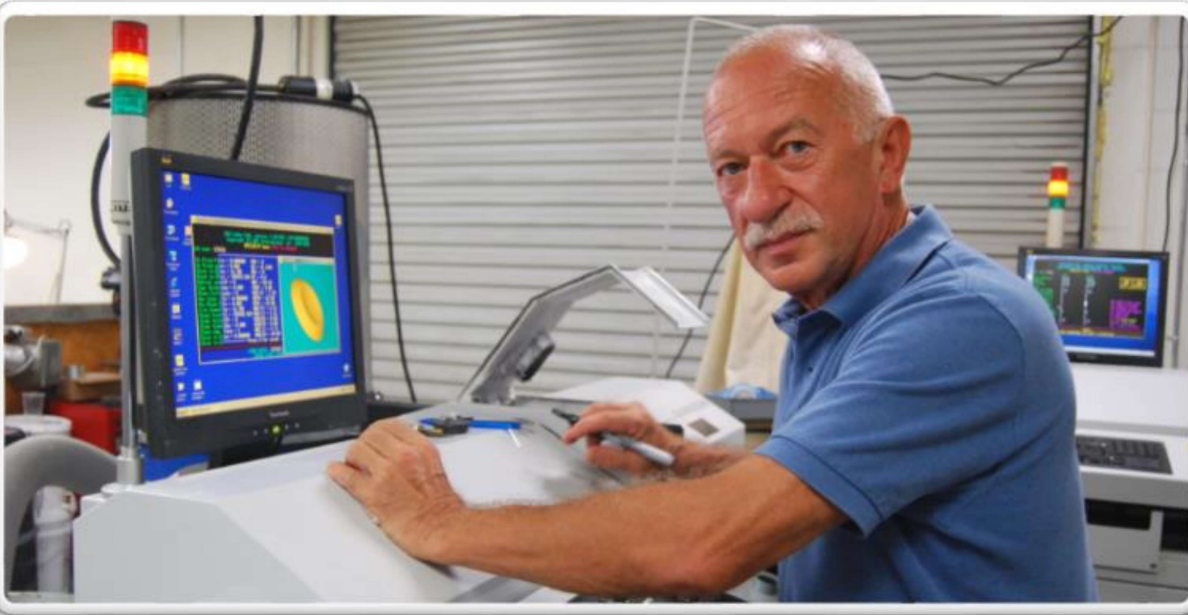


UNIQUE APPLICATIONS OF 3D LENS PRINTING

- QUEST SPECIALTY LAB: LARGO FLORIDA
 - INSTITUTE FOR THE BLIND: NORTH CAROLINA
- 

QUEST VISION SPECIALTY LAB

- MICHAEL
WALACH

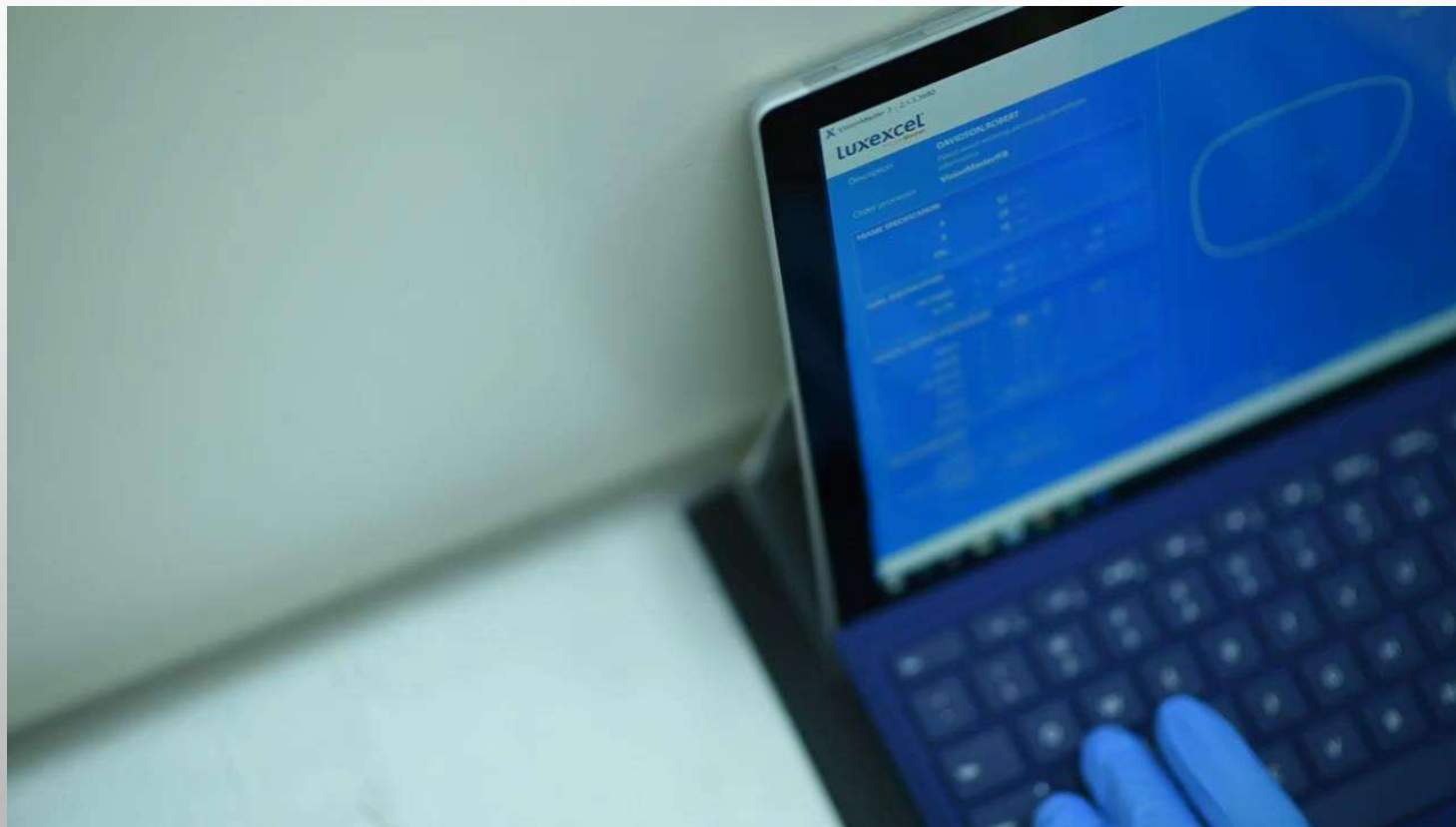





LENS WITH 15[^] PRISM DIOPTERS

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INSTITUTE FOR THE BLIND (IFB)




The background of the slide is a light gray gradient with several realistic water droplets of various sizes scattered across it. Some droplets are in the upper left, some in the lower right, and others are smaller and more numerous in the center. They have highlights and shadows, giving them a three-dimensional appearance.

**AND THE FUN DOES NOT STOP
WITH LENSES!**

3D PRINTED FRAMES




MANUFACTURING A 3D FRAME

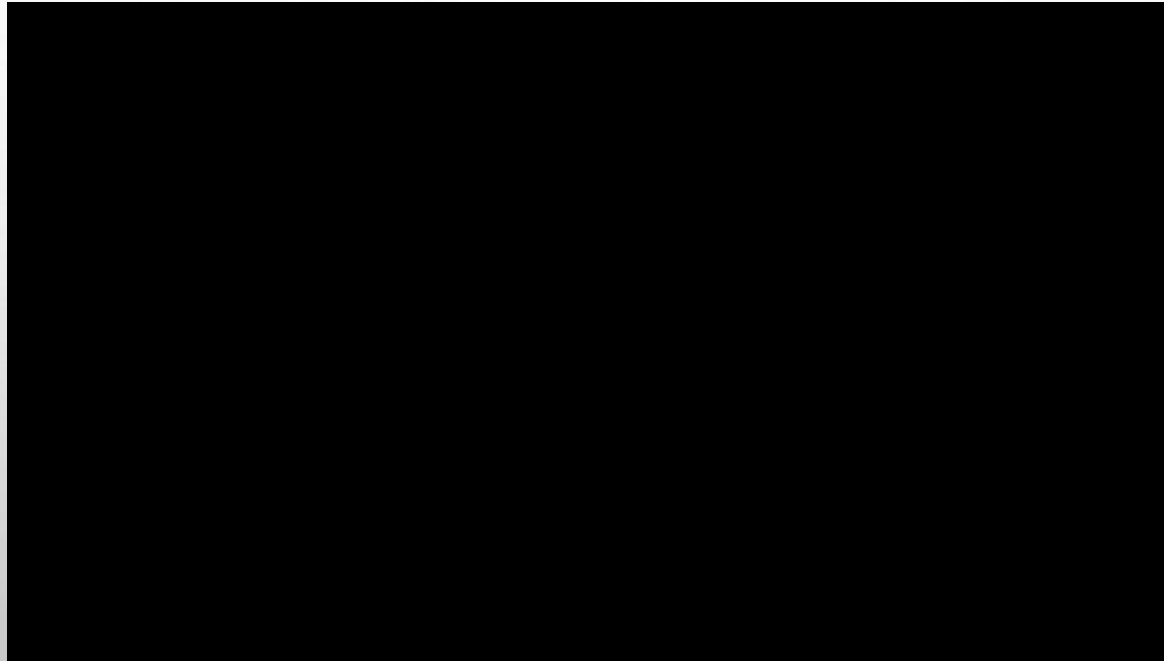
- FRAMES ARE MADE TO ORDER WITH A 3D PRINTER
 - 'ONCE THE FOUNDATIONS HAVE BEEN PRINTED, WE WORK WITH OUR HANDS TO POLISH, BUFF, AND ASSEMBLE EACH AND EVERY FRAME'. (SPECSY CANADA)
- 



3D FRAMES

- FRAMES ARE CRAFTED FROM NYLON. OUR FRAMES PASS THROUGH A POST-PRODUCTION PROCESS THAT RESULTS IN A FRAME THAT IS LIGHTER WEIGHT AND MORE DURABLE THAN TRADITIONAL ACETATE.
 - FRAMES ARE ADJUSTABLE WITH THE USE OF A HOT AIR WARMER.
- 

**EXAMPLE OF 3D PRINTER CAPABILITIES
(AN EXAMPLE OF 3D PRINTING IN GENERAL)**



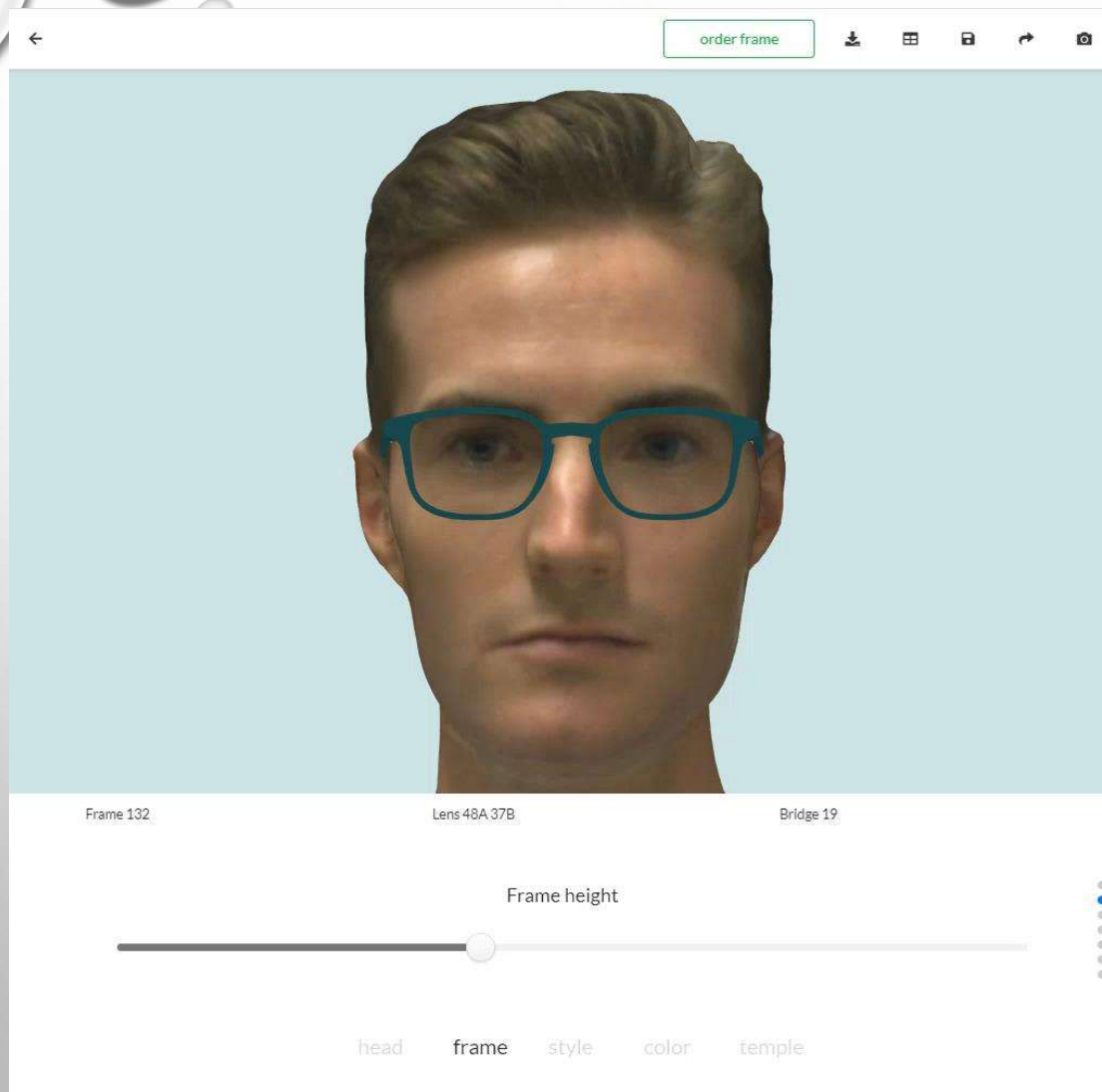
3D PRINTED FRAME





SCAN

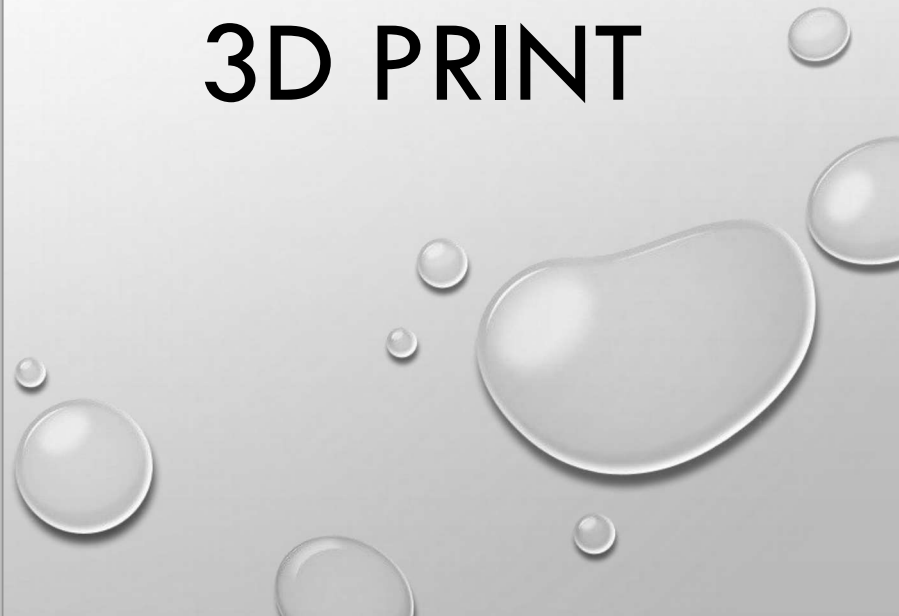




DESIGN



3D PRINT





THANK YOU FOR YOUR TIME!

QUESTIONS?

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