

The logo for Brick Journal, featuring the word "Brick" in white on a red rectangular background, followed by the word "Journal" in black. The background of the entire page is a blue grid with white lines and arrows, suggesting a technical or financial theme.

PRESENTS

Brick Journal PRESENTS

MINIFIGURE CUSTOMIZATION

POPULATE YOUR WORLD!



Minifigure Customization

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Chapter 1

LEGO® Minifigures: a History

Any student of history knows we build on the past, therefore a short review of the history of the minifigure will help improve your custom creations. Specifically, we can learn where LEGO has succeeded and failed so we don't repeat their mistakes and can recreate their successes in our designs.

The LEGO Company created the minifigure in 1974. This figure did not have functioning arms and legs, yet it changed the way we play with the bricks, allowing for role-playing. In a short 4-year period, by 1978, this figure was altered into the figure we know today. The first modern minifigure was a police officer. In total, 7 different figures were created for the themes of Town, Space, and Castle in 1978. These early figures as well as those created today are compliant with all LEGO system standards. Specifically, the minifigure body is three bricks high and the head is one brick high. The figure has the ability to hold LEGO bricks and it can be connected standing or sitting on top of other LEGO elements. It is this scale that will challenge your ability to create custom figures and parts for those figures.

Two months after the release of the initial 7 figures, the LEGO Group released the first female figure, a nurse. Back in those days, the torso designs were created with stickers and the figure's head sported the now classic smiley face. During this era, the goal was not to limit a child's imagination and play so the figures were supposed to have no gender, race, or role; these characteristics were to be defined by the child. The nurse sported a feminine hairstyle, so even from the beginning of minifigure creation LEGO has been conflicted in designing figures as the nurse went against their policy to not define the gender of a figure.

It didn't take the company long to develop the minifigure. In the late '80s with the release of the LEGO Pirates theme, minifigures needed to change their facial expressions from happy and neutral to happy or grumpy and good or evil. Figures also developed ocular issues requiring eye patches and required prosthetic hooks and wooden peg legs for lost hands and legs. These new figures helped drive sales of the Pirates theme to new heights hinting at the power of the tiny titan.

The minifigure had a big decade in the '90s as it was animated for the first time in "Panic on LEGO Island" and was incorporated in the first LEGO licensed product with Lucasfilm Ltd. to create the characters of the Star Wars galaxy. This resulted in many firsts for the figure; most importantly, this was the first time a figure took on a specific role as they represented the characters from the film. It also represented innovation of the figure itself as LEGO created the clamshell head to create Chewbacca and later used the same strategy for the Gamorrean Guard. In the late '90s LEGO had another first for the minifigure: the Native American Indian figures of the Western theme sported a nose. Also during the era the figure was spotted showing off its toes with the release of the Pharaoh Hotep in the Adventurers theme.



Some of the landmark LEGO minifigures that have been produced.



More of the landmark LEGO minifigures that have been produced.

In 2000, the LEGO Group created soccer player figures that stood on spring-loaded platforms, allowing them to become a functional element. From this step, the company launched basketball figures which placed springs directly in the legs of the figures. With the launch of the Basketball figure came the NBA figures which, for the first time, featured figures with more authentic skin colors. Also during this time the figure started taking on other ethnicities, which is evident in the Orient Expedition and Ninja themes. In 2004, all LEGO licensed products started featuring more natural skin tones as they represented real-world characters. This was started with the Lando figure in the Star Wars Cloud City set. This set was a bit confused for LEGO as Lando featured a more natural skin tone yet every other figure in the box was still yellow-skinned. With the release of more natural skin tones, this has freed the design palette to once again contain yellow. Designing anything that contained significant portions in yellow made the figure appear scantily clad or perhaps even nude. As a customizer, the decision will have to be made to use either yellow figures or the more accurate skintones.

Over the years, the LEGO Group has tried many different design options on the LEGO figure. The figure has been featured as knight, astronaut, policeman, racing driver, space warrior, Harry Potter, Santa Claus, Steven Spielberg, crane operator, football player, explorer, nurse, basketball player, Spider-Man, frogman, skier, fireman, skeleton, pirate, rollerskater, American Indian, queen, and the list continues to grow. The figure has had various ethnicities, expressions, noses, toes, flesh tones, etc. As many different designers created these figures, there has been a continuity issue with the minifigure. To address this, the LEGO Group has recently prepped a 300-page book on how to display and design the figure. This book was promoted in an internal memo that like (many internal LEGO documents) was leaked to the public on the internet. While we don't have access to this book, the memo gives away several "do's" and "don'ts" for minifigure design. Several of these new rules have been broken already by LEGO.

In the leaked article about the guide, the company states, "Since 1978 more than four billion minifigures have been manufactured with different types of clothing, equipment, and facial expressions. The minifigure lives on in many different versions – **but preferably not too different.**" It is this last statement that is concerning to the community of minifigure customization. By limiting the figure it limits our ability to "just imagine." This means we sometimes have to create from scratch to fill the void where LEGO leaves off. The leaked pages also reveal that a minifigure may not have a nose except in special circumstances and gives the example of the Clown recently released in the Collectible Minifigure Series 1. LEGO goes on to state that the figure was an accessory to the bricks, originally, but has become an icon today. Well, LEGO needs to realize the paradigm shift that in many cases the bricks are actually accessories to the figures. The article announcing the guide also notes that figures are not to have toes and that all designs will portray the figure as modest. As a creator, you will need to decide when to stand by the rules or examples that LEGO sets and when to break them.

Chapter 2

What is Customizing?

After an examination of the minifigures supplied by the LEGO Group, it is important to figure out just what it means to customize the figure. Where does customization begin? Can you merely switch out the accessory, change the hair or hat, or alter the figure's leg color? This is a question that only the customizer can really decide. The way I define customization requires a vision, much like a sentence requires a complete thought. When you have a vision of a custom figure and proceed through a process of executing that vision to find or create the combination of parts needed to create that custom figure, you have customized and created something new. Merely switching parts around isn't really customizing.

Here are a few examples of some great custom figures:



A diverse assortment of custom-created minifigures, ranging from brickbuilt figures to modified figures. The figures are (from top, left to right) Gunner by Jordan Schwartz, Iron Man by Moko, Minifig Dissection by Kris Buchan, Boushh by Christopher Deck, the Watchmen by Jordan Schwartz, and Napoleon by Gaetano Dooms.



Kris Buchan's Darth Krayt.

Notice that several of the customs seen in these images use official parts (known as purist customization), decals, modified LEGO elements, commercially available third party parts, and new parts from scratch. Many consider purist customization as the most difficult; as this group of customizers commonly use parts in new and creative ways. The techniques used to create the custom figures seen in the montage in the previous page will be explained in the following chapters.

In the previous chapter, we have examined minifigures supplied by the LEGO group, which is important as it helps define a figure and where customizing starts. Now you need to determine what it means to you to customize a minifigure. Can you merely switch out the accessory, change the hair or hat, or alter the figure's leg color? Ask yourself: how much impact does it really make? Changing a leg color for example could be very impactful, if the right color was used, like flesh or yellow. Recall that customization requires a vision, much like a sentence requires a complete thought, therefore executing your vision of a figure results in a customized and newly created figure. Merely switching parts around isn't really customizing in my mind. As one last justification, when you sit to build something out of bricks, do you merely start randomly sticking bricks together or do you have an idea, no matter how vague, of what you want to build before you start trying to build it. A custom figure should be no different. You need to know what you are building before you attempt to build it.



Moko's custom girl figure.



Robert "Tothiro" Martin's Bossk minifigure.

Chapter 4

The Customizing Toolbox

Cotton swabs and paintbrush, for decal work.



Before jumping off into any hobby, it is important to understand the tools needed to get real enjoyment from the hobby. In this chapter many of the tools will be outlined and if I can provide an economical source for them it will be noted. Please note sources referenced are in the US, where I am located.

The Customizing Toolbox represents the typical tools used for different customization techniques; these are by no means absolutes. When I started sculpting, I used paperclips, broken plastic forks — whatever I could find. This is merely a guide. Clearly the one group of parts you can't avoid is minifigure parts, which will not be covered here, so check Bricklink. This chapter will not cover the tool use, merely what is available, where to find them, and what skill set they apply to. The point of this chapter is to point you in the right direction early and hopefully save you a few dollars on the tools you do purchase.

Decaling

Software

Draw Plus	www.freeseerifsoftware.com/software/drawplus/	Free
Inkscape	www.inkscape.org	Free

Printer

Printer	www.spoofee.com for deals	~\$50
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Decal Film

Testors Custom Decal	www.testors.com/product/0/9198/_/Custom_Decal_System	~\$10
Micro-Mark Decal Film	www.micromark.com/decalling.html	~\$10

Total Cost

~\$60

The foundation of minifigure customization lies in custom decals. Waterslide decal film is used to affix a new design to the minifigure parts. This part of the hobby requires a few items: vector art software, waterslide decal film, printers, decaling solutions, and application tools.

There are several vector art programs out there including CorelDRAW (my favorite), Adobe Illustrator, Draw Plus, and Inkscape. The last two are mentioned as they are free, which are great alternatives to the high-priced commercial options.

Waterslide decal film can be found almost everywhere these days (hobby and art shops) including Wal-mart. Typically decal film is about \$1 per sheet. You can pick it up locally to avoid shipping fees. While these brands aren't the best, they are not bad to start with as they are generally a bit thicker and easy to apply. The most commonly found film is from Testors. If you can't locate this option, Micro-Mark offers an excellent film. Testors' film is strictly for inkjet printers, whereas laser and inkjet options are available from Micro-Mark. You must choose film that is designed to use with your printer (laser or inkjet). Please review the section on decal printing (page 20), especially if you choose an inkjet option as the decals MUST be sealed prior to dipping them in water.

if you don't already have one. If you don't mind internet purchases check Spoofee.com or other bargain-finding sites for a few days and I am sure a deal will pop up.

Decal application tools are the next items required. Decal setting and softening solutions are critical to advanced application techniques and highly recommended. These solutions can be purchased at most hobby/model stores. The typical brands are Badger, Model Masters, and Microscale. Badger brands can be found at Micro-Mark. For others you will have to search online or locally (Model Masters is fairly common and can likely be found locally). The free option is diluted white vinegar (2 drops of water to 1 drop of vinegar). To apply these items you will need some small brushes. I recommend inexpensive nylon brushes, which can commonly be found at dollar stores. I prefer nylon because they seem to last a bit longer. Wood stick cotton swabs and tweezers are also very helpful and can be purchased economically at a pharmacy. Decal sealants are also needed and are merely clear paint; spray cans offer the easiest application. You don't need an airbrush, merely buy spray paint. Model Masters has a great clear lacquer option; however the \$3-5 clear Krylon at Wal-mart works well. Before spraying, ALWAYS make sure the nozzle is clean so it won't splatter when you spray your decals or figures. Also make sure the decals are completely dry first.



Micro-mesh.



Preval paint sprayer.



Nylon paintbrush.

Dental tools for sculpting.



Rubber-tipped clay sculpting tools.

Paints and Dyes

Of all the tools needed, paints are the easiest to find. You can pick up Testors hobby paints cheaply at most stores. Look for the primary color bulk paint packs, these typically run \$5-10 and have 8-15 paints of various color in them. These paint packs are a very good value for your money. With a primary color pack you can mix and make most any color. The hobby uses small items that don't require much paint, so mixing your own paint with a few drops from a bottle works great. Sometimes these packages come with brushes, sometimes they don't. Recall from the previous section that dollar stores commonly offer assorted brush packages, so one purchase can have two functions (painting and decaling). Even if most brushes in the package are not useable the few that are will be worth the price, so check an art store's pricing for one or two brushes. Personally, I like nylon brushes as they last quite a while. Typically nylon brushes have white or brightly colored bristles of uniform color.

There are alternatives to painting such as vinyl or fabric dyes. These are much more permanent alterations to the parts and typically cannot be removed by scratching the part as they absorb into the plastic. Vinyl dyes can be found at automotive stores, the drawback is it is typically only available in limited colors. Just be sure you are purchasing a vinyl dye and not a vinyl colorant. Refer to the color alteration section for the difference (page 28). Fabric dyes are available most anywhere including Wal-mart. The liquid versions seem to work better, so search these out instead of the powders.

An airbrush is a nice tool to have, but not always cheap. The low-cost option is about \$30, but these are really only good for broad coverage and don't always meet every need. Investigate this tool heavily and only purchase when you are sure you have a need. A much cheaper alternative to an air brush is a Preval paint-sprayer. This system has a container you can add any paint to and turn it into a spray paint.

Sculpting (Clays and Tools)

Packages of sculpting clay are very economical and can be found most anywhere. You can work with the clay with homemade tools: paperclips, tongue depressors or popsicle sticks, and anything else small. However, some economical tools are available from Harbor Freight. There are more expensive options at art stores that have rubber tips or made from surgical stainless steel that are quite nice, so ask yourself how much sculpting you are going to do. Most often the lower priced tools are more than enough.

While the rubber-tipped modeling tools mentioned above are not absolutely necessary one or two can be helpful. These typically cost about \$6 per tool. Luckily I find them locally, but depending on where you are you might have to look online. These tools are really quite nice and work great as they allow for very subtle detail work.

Baking sculpting clay uses your home oven (no expense) or you can cure it in near boiling water. Practice clay sculpting BEFORE getting into molding and casting as they can get quite expensive. Not every piece needs to be molded.

With the basics out of the way let's discuss decal design style. I am sure at one point in your life you have seen a cartoon. Cartoon styles run the gambit from Mickey Mouse to very risqué scantily clad superheroes. In order to draw a design you need to decide or discover your design style; actually you don't even have to limit yourself to a single style. For example, the LEGO Company is confused about its design style; examine the older versus newer figures or for that matter across LEGO themes. Most recently, some internal memos have leaked from LEGO that reveal the fact that the company is trying to address this very issue with the release of an internal 300-page book that defines how minifigures are to be represented and created. In order to help you define your style let's examine others work. This way, we can better understand what we like and dislike. Therefore you can better translate your favorite character into LEGO form. Let's visit variations in the official LEGO design style; I bet you may never have noticed many of the options LEGO has included in their design palette. Bricklink is a wonderful reference for information on various official LEGO minifigure designs produced over the years.

2D versus 3D

Our favorite minifigure started out ages ago with simple 2-dimensional designs that adorned its chest and head. These designs are simple and quite easy to create and can still be used to capture most custom figure's needs. Please consider 2D designs when creating a new custom figure decal. With time and the modernization of the minifigure design, the styles used have become more complex including drop shadows on ties, belts that flop off the figure, curvy pockets and necklines, and cloth wrinkles. These all attempt to add depth or a third dimension to a design. They make the flat surface look more than it is and give the illusion that the figure surface is textured. The female hip area on the Slave Leia Minifigure is a classic example of this illusion. These features can add a great flair to a design and give the figure more shape.

Expressive Faces

The simple smiley face has come a long way, however it is still at home in the LEGO-verse. Today's smiley features pupil reflections. However, once LEGO crossed into the world of Japanimation with Exo-Force and Avatar themes, expressions took on a whole new meaning, giving the characters more complex emotions. This is not to say that LEGO didn't have the occasional scared or grimacing face, but these themes seemed to free LEGO to dive into a whole new series including the Christmas carol singer with rosy cheeks and a tongue. While the customizing community has been adding more expressions for some time, especially the stop-motion animation film makers, LEGO just now seems to be catching up.

As a customizer we can do better to capture those grimaces, snarls, frowns, and overjoyed expressions. This



Classic 2D decal style.



Newer expressive faces.

With the knowledge of how to create waterslide decals, one needs to conquer the next needed skill, application. Waterslide decal application is quite easy and can be done by most anyone. There are basic application instructions, which work well for flat surfaces and advanced instructions, which are needed for complex curves (helmets, arms, and odd parts). Before you apply a decal to any LEGO element, you need to start with a clean slate or brick in this case. This means you need an unprinted part/torso. Don't have a torso without any printing? No problem. A quick trip to the grocery store, Walmart, or most any hardware store will get you what you need to solve that problem: A \$3 bottle of Brasso® micro-abrasive metal polish. Brasso, or any micro-abrasive polish, can be used to polish or sand the printing off any LEGO element. Micro-abrasive polishes include toothpaste, metal polish, and some other cleaning agents. Brasso is the easiest to find and the one that works the fastest. It is also great for removing scratches on older bricks or improving the transparency of older cloudy transparent bricks. It is a great product for any builder to have and one bottle will practically last forever.

Brasso Instructions:

1. Pour a small amount of Brasso (about the size of a quarter) on a paper towel or cloth.
2. Place the cloth containing the Brasso on a flat surface with the Brasso side up (Please note DO not place the cloth on a surface it could damage).
3. Rub LEGO element or minifig part vigorously against cloth containing the Brasso. Apply more Brasso if necessary. Removing the printing from a torso should take 15 seconds to 1 minute depending on how much elbow grease one uses.
4. Once the original print has been removed, wash the LEGO element with soap and water, making sure to remove any residual Brasso. Rub the element dry with a clean paper towel and verify all Brasso residues were removed. Stubborn Brasso can be cleaned up with a cotton swab.



Now you have an unprinted LEGO element ready for application of your newly designed decal. This can be done by either the basic or advanced methods. The difference is the advanced method helps the decal to conform and adhere to the surface a bit better than the basic method, but it requires a few more reagents. The basic method will be covered in the next pages and the advanced in the following section. Before you begin, gather the few items together that you will need for application, these include:

1. Small paintbrush
2. Q-tip® or cotton swabs
3. X-acto® Knife
4. Tweezers or forceps
5. Pair of scissors
6. Tray of distilled water

to the decal and let dry. Decal setting solution strengthens the bond between the decal and the part surface. It also helps remove any trapped air.

Step Two: Softening the decal

Decal softening solution makes the non-printed areas of the decal more transparent, giving the part the appearance of a directly printed design and it allows the decal to conform to complex surfaces. Using a soft brush, gently apply Decal Softening (solvent) Solution to the surface of the decal. Do not touch the decal until the solution has completely dried as the decal is **VERY FRAGILE** at this step. Repeat the application of the Decal Softening Solution until the decal has fully conformed to the surface and all air is removed from under it. Be sure to allow the solution to completely dry between applications; otherwise, you may damage or wrinkle the decal while it is soft.

Step Three: Protecting your new figure – Application of a clear top coat

Next, apply a clear top coat to the decaled area and decal edges to protect the decal. Clear gloss hobby paint works well. Hobbyists have been known to use quite a variety for overcoats including nail polish (which yellows in sunlight, so I don't recommend), Future's floor wax (sworn by many model makers www.swannysmodels.com/TheCompleteFuture.html), spray paint, airbrush paint, and brush on overcoats. I prefer Badger overcoats, which I apply with a water-moistened paintbrush, and Testors' clear gloss spray lacquer. Both work well and are easy to use.

Tips and Tricks for Application

There are several tricks that can be used at every step of the basic and advanced decal application, so be sure to read the following and think about where to use them above.

Cotton Swab:

The power of the cotton swab has been mentioned, but I really can't stress this tip enough. The cotton swab, especially the wooden stick version, is the best tool to apply decals (see figure 2). Use a very wet cotton swab when positioning the decal. However, a slightly damp swab is called for when removing trapped air bubbles and to absorb excess water. A completely dry swab is never recommended as it can stick to the decal. These wooden tips of these swabs are also useful to position the decal (See the hairdryer trick section below for more cotton swab uses).

Trimming/Strategic Cuts:

After you have read the advanced decal application and the use of decal softening solution you are likely asking, "Why do I need any type of cut strategy?" Well, through the use of strategic cuts, you can help the decal conform to curves and help remove the possibility of wrinkles in your decals.



Decal solutions.



Overcoat paints in gloss, satin, and flat finishes.



Tricks and tools of the trade. Upper left image is of wooden stick cotton swabs, upper right demonstrates using the wooden stick cotton swabs to hold parts, and lower panel images show common overcoat solutions and the soft bristled nylon application brushes. Custom headpiece by Bluce "Arealight" Hsu. – Photos by Jared and Amber Burks.

Paint:

Paint is the most widely used method to alter LEGO part colors. There are two types of paint, enamel and acrylic. Enamel is an oil-based paint that will dry slowly and requires paint thinner to clean up. Enamel can also have strong odors. If you are using it in any volume, be sure to take frequent fresh air breaks. Acrylic paints are water soluble, meaning they can be thinned and cleaned up with water, as long as they haven't completely dried. It is because of these two factors that I recommend acrylics.

When using paint, it is best to apply it in thin layers and build to the final finish. This will make a stronger finish overall and leave the least amount of buildup on the part. Buildup is the accumulation of paint on the part and when visible, it noticeably detracts from the final custom figure. It is better to apply three thin coats than one or two thick coats to an element to help avoid buildup (see the third blue head from the left in the paint vs. vinyl dye photo on page 31).

There are two basic ways to apply paint: with a bristle brush or an airbrush. If you have an airbrush, you likely already know it is a wonderful tool to apply paint to broad areas. Cheap airbrushes are all you really need, such as the ones that use small compressed cans of air. Slowly sweep across the part applying three sequential thin coats of paint. If you don't have an airbrush, however, adequate results can be achieved with a bristled paintbrush with a bit of patience and practice. I prefer nylon bristled brushes. Following the recommendation above and use several thin coats. Be sure to give each coat plenty of drying time before application of the next coat. Painting takes practice, so you might want to try a few test pieces before painting your rare LEGO element.

Paint does have flaws. Much like markers, it can wear or scratch off. It can also be hard to get perfect finish with a brush and, as mentioned before, you can get paint buildup. Minifig hands are very difficult to paint as it will almost always chip off if you routinely place anything in the figures hand. Because of these issues, many have sought out alternatives.

Dyes:

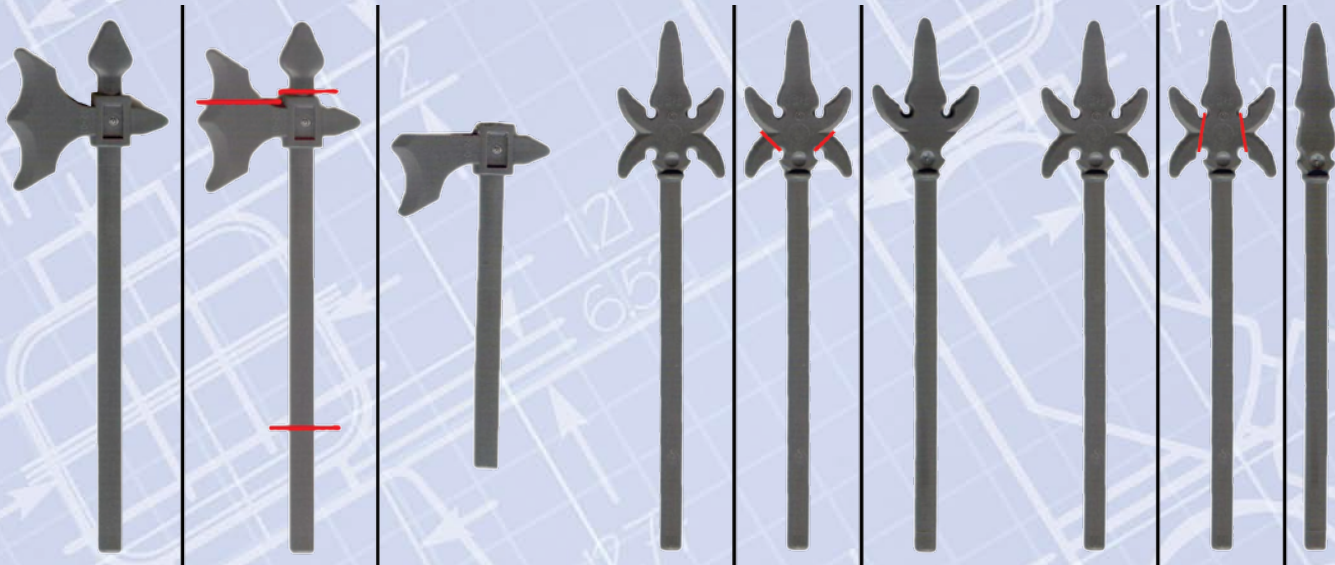
Dyes are more permanent color changes since they penetrate the surface of the LEGO elements. They do not build up on the surface making it impossible to chip off the part. However, they can be difficult to find and temperamental to use. As a result, there is no perfect solution to part color alteration. The two different dyes commonly used are RIT fabric dye and vinyl dye.

The RIT fabric dye website states, "RIT can be used to dye many different types of materials including wood, paper, plastic, feathers, and even canvas shoes!" RIT fabric dye can be used to alter the color of lighter elements to darker shades; however it cannot be used to lighten darker elements. RIT dyes can be mixed to create custom colors, making it a good alternative to paint if you need a darker element. Their website gives some guidelines for what colors can be obtained based on the starting color



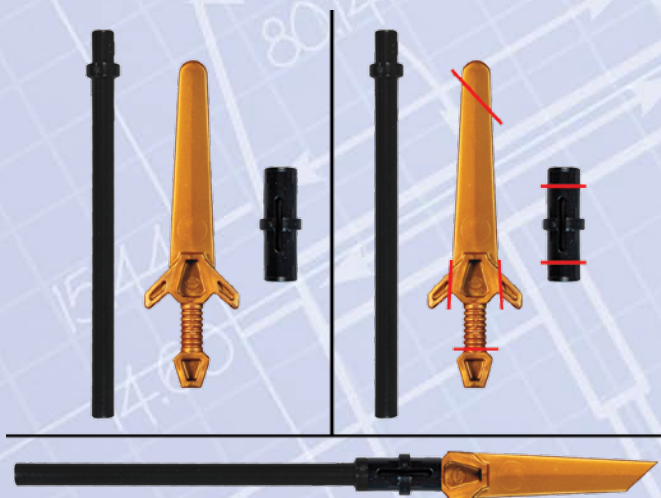
The Cyclops, originally a Harry Potter troll, received a full body color alteration using a custom mixed Testors' acrylic paint. Ghost Rider's motorcycle is painted silver and Yoda's head is painted with acrylic paint.

Well our knights are equipped, now our castle guard needs to be able to fend off the evil black knight. The classic weapons for this are long two handed style weapons, polearms, halberds, pikes, and spears. So let's take our new found skills and step them up just a bit with some precision cutting and in the last example, the naginata, some precision gluing.



Two-handed Weapons: In this example two precision cuts alter the LEGO pike into a different type of pike, so now we have a bit of variety (the removed pieces can also be useful so save them).

2. Want to make a fancy spear? With 4 precise cuts you have a new spear. 3. Now let's make a large axe style halberd. With a few quick cuts you have one, just be careful or you can remove too much. It is always better to remove too little as additional cuts can be made.



Well, you have small cutting down, let's get a bit complex and mix this together with some glue again and make a naginata. Just be careful here, I know it looks like the handle of the sword is removed but it is really inside the technic pin. Concepts by Emily Brownlow.

Accessories aren't limited to weapons. Want to make a new hat? Well, grab some sandpaper and let's get to it. Honestly, most of the items presented so far can be made with sandpaper. In the next example, no knives were used, just sandpaper, Brasso, and a small hand drill. The sandpaper is used to remove the top of the pith helmet to make it look like a floppy hat.

One of the greatest tricks in parts creation is the use of Brasso. No one likes those cut marks or rough areas left by sandpaper, we all like shiny bricks. Well, Brasso can do just that, restore shine (Micro-Mesh Sand paper system can also accomplish this task). After you have cut and/or sanded a LEGO element, take a rag with Brasso on it and rub the cut area until the "evidence" of the cut or sanding is removed, then wash the element. Now you have a new accessory that shows no signs of having ever been modified. After you have the hat shining, use the drill to

as paper with no need for tape. The advantage of printable cloth is you get to print the designs and the background color, so you can make your cloth part any color you want. Printable cloth is typically treated with an anti-fraying solution, but read the instructions that come with your package to make sure. If you need to add an anti-fray agent, stay tuned: those details will follow shortly. Customizers in the know favor the Jacquard's printable cloth brand, but most any brand will work. If you cannot find printable fabric locally, check online. Some brands of printable fabric only allow you to print on one side, so if you are wanting the cloth to be the same color on both sides you might have to pull out your hobby acrylic paints, which work well on most cloths, including LEGO cloth. If you want to make it all you can even make your own printable cloth, according to the HP website (Instructions: h71036. www7.hp.com/hho/cache/313-0-0-39-121.html).

The last two options are leather and broad cloth, the latter being similar to LEGO cloth. Leather is simple, merely cut out your shape in thin leather and you are done. Leather can add a texture to your figure as one side of the material can be polished and the other suede.

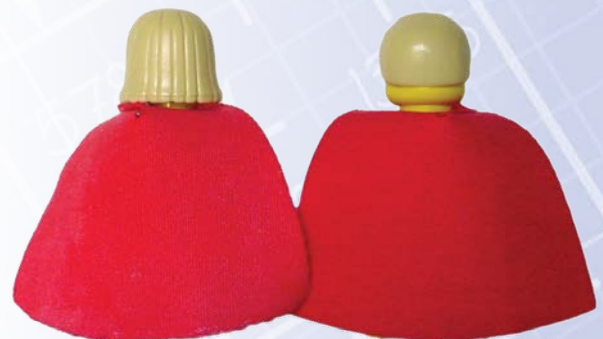
Broad cloth is a bit more difficult than leather. The main issue with cloth is fraying. You have to prevent fraying without making your cloth so thick that it does not work/bend/fold well. One of the issues is that if you are making a complex cloth accessory, it can become visibly thick and interfere with the arm or waist studs. There is no right or wrong way to stop fraying. It can be as simple as running a small bead of glue along the cut edge or as complex as painting the cloth with acrylic mediums. Try different things and see if they work. No matter what you apply to your cloth, it is going to have an instant stiffening effect. More on the anti-fraying solutions in a minute, just remember the more you apply, the stiffer your final piece will become.

Now that you have worked with the patterns that LEGO has given us and used the different materials, you are ready to make your own patterns to create completely new cloth items. Try starting with a piece of paper and a ruler. Draw out the shape you are after and figure out how to connect it to the minifigure. Will you use the neck stud, the armholes, the leg studs, or all three? These are all options and Mark has figured out most of them, so you might look at his work for inspiration. Whenever I am trying to make something new, instead of cutting up my treated fabric, I draw it out on paper and cut up paper. I refine the pattern and then transfer it to cloth.

The most important tool for this work is a sharp pair of scissors. If you are a younger reader ask for help from your parents. I recommend Fiskas' brand scissors, which are a bit more expensive, but are worth every penny. If you want to get techie and are planning to make a lot of cloth, get a set of punches to more accurately cut your neck and arm holes in your cloth. An inexpensive alternative is a leather punch tool with a rotating punch size (see the toolbox chapter, page 13).



Paper: Armothe (www.brickforge.com/) makes complete custom figures with nothing more than paper, by wrapping the figure in a design. Notice the flat design, with neck and armholes on the left and the figure wearing it on the right. Photo and figure by Kyle "Armothe" Peterson



Printable cloth (left) compared to an official LEGO cape (right). Photo by Chris Campbell.



Leather is also useful to make accessories, as seen on this minifigure. Very sharp scissors are needed in trimming out this type of material.



Parts Created from Clay! These techniques have been used by others. Here are creations from Bluce "Arealight" Shu (Pig, Monkey King, & Scooter - top row), Robert "Tothiro" Martin (Hellboy, Star Wars Bossk, Nabru Lieds, Ponda Baba, & Talz - second and third row), and Jared Burks (Tauntaun, Aurra Sing, Cad Bane, Shaak Ti, and Mohawk, last row, left to right).

If you are creating a hairpiece or some other accessory item that must attach to a LEGO element, you will likely want to remove it after you have finished sculpting it. Removal can be tricky if your clay hasn't completely cured. Removal of incompletely cured clay can also result in damage to your creation. To help with part removal, you can wrap the LEGO element it attaches to with very thin aluminum foil or parafilm. Parafilm is a stretchable wax-like product that is used by hobbyists when painting models. It can be found at hobby shops or online. Another great trick is to sculpt over the top of another element. You can sand down a LEGO hair piece to a "skullcap" and add clay to the top of it allowing you to sculpt a new hair style, helmet or whatever. Most importantly this allows you to keep the internal stud acceptor and more easily remove the cured part. Just remember the plastic is present when curing parts created in this manner. They will need to be cured at slower/lower temperature, (layered sculpting page 43).

The final tip/trick I have for you is the use of clay sealants and air-drying glazes. The sealant is sold with most resin casting kits and the glaze is found with most clays. Both the sealant and glaze strengthen the cured clay and give it a finished sheen. This finish allows the paint a better surface to stick to and results in a finish closer to plastic. If you want to jump in and paint it, I suggest acrylic paints. They are easy to find and clean up.

The Wrap

This chapter will end as it began it; sculpt, sculpt, and sculpt. Only through practice will you get better. Sculpting and re-sculpting a piece will teach you something each time you make a design. Everyone needs a hairdryer, even if you are bald. Sandpaper is your friend: sand early and often, always increasing in grit. Seal your final part to give it that LEGO sheen. Finally, check out some of the great items created in clay below for inspiration.



Step 1: This diagram displays the starting element, the trimming of the 1x1 stud, the rotary tool bit used to create the flat spot on the back of the hair, the region the bit was used, the glue used, and the stud glued into place.



Step 2: This diagram displays the progression of marking off the hair for the mask, removal of the area, wing supports cut from styrene and attached with plastic weld, and clay roughed out.

6. Sand down the region to allow the clay some space.
7. Cut out styrene supports for wing portions of the helmet.
8. Glue supports to the head.
9. Cover in clay and shape the mask part.
10. Use hairdryer or hot water to cure clay.
11. Paint (or mold, cast, paint).

There are several types of glue available. When attaching the stud to the back, we will need a very strong bond. To get the best bond, use plastic welding glues (Plastruct Plastic Weld). These types of glues surface melt the plastic of the two parts and bond them together. It is CRITICAL to be careful when applying these glues to not damage the rest of the part. If you spill or misplace any plastic welding glue on other regions of the part, set it aside until the glue completely evaporates and then give it a few more minutes for the plastic to stabilize before continuing. Superglue could be used, but the strength will not be the same as that achieved when using plastic welding glue.

Now that we have the needed back stud to attach the wings (their creation will not be covered here) we need to modify the top of the head to make space for the mask. To start the area will be masked out with a marker to guide while the sanding. Use a rotary tool with a sanding attachment to remove as much material as possible without damaging the interior structure of the hair piece. By removing the excess hair the mask will be more properly proportioned. The removal could be done with a hobby knife, if this is what you choose please exercise extreme caution. The rotary tool will make short work of the region and is much safer with the sanding attachment.

Now that we have the part prepped for the addition of the mask we need to find some styrene. Sheet styrene in various thicknesses is found in hobby stores for model builders. We will use the styrene to cut out the basic shape of the mask wing. These will act as supports for the clay. As the front part of the mask will be too thin to hold styrene we are only adding it to the back of the mask. Styrene is an interesting item to work with; it doesn't need to be completely cut through. You can score the design and then bend the styrene and it will "pop" out. Once we have the basic shape cut out we can sand the two sides to make them identical. Attach the styrene to the head with the plastic weld glue.

With the styrene supports in place it is time to add clay to the head and sculpt out the basic shape of the mask. When you are satisfied with the shape you will need to cure the clay. If you recall from the sculpting chapter, there are multiple ways to cure polymer clay including baking, hot water, or hairdryers. As we have added clay to a LEGO element, we can't place it in an oven for fear of melting the LEGO element. Out of the remaining curing options I prefer the hairdryer, however you can use either the hairdryer or hot water. When using the hairdryer, use a lower heat

Silicon Rubber Molds

Now that you have learned to make new parts, it is time to learn to mold and cast them in more durable materials. This section will present information on creating silicon rubber molds to replicate your custom-created elements. As you will be using chemicals in not only the creation but also the use of silicon rubber molds, please READ all safety information for all the products you use. The creation and use of silicon rubber molds by younger readers will require adult supervision.

The custom elements that you have created will now be referred to as prototype parts or prototypes. This is because they are one of a kind. As they are unique you may wish to replicate them or simply make them more durable. Silicon rubber molds are the best option to accomplish either of these means. There are many manufactures of silicon rubber for molding including; Smooth-On, Alumilite, MicroMark, and others too numerous to list. When making a silicon rubber mold two compounds, silicon rubber and catalyst, are mixed in a proper ratio to start a chemical reaction causing the silicon rubber to cure to a solid state. Many brands mix by a weight ratio, meaning a large amount of silicon mixed with a tiny amount of catalyst. These weight ratio mixes require the use of a gram scale to accurately recreate this complex mix ratio. However, the Smooth-On brand features a convenient 1:1 mix ratio, eliminating the need for very accurate weight measurements as they mix by volume.

Silicon Rubber Characteristics

Now that we understand the differences in mix ratios we need to discuss the differences in the many types of silicon products. These different types allow for the creation of molds with different features. Therefore it is important to understand what each type of silicon is for and it's weakness and strengths. There are four key features to understand about silicon mold rubber; elongation at break, tear strength, pot life, and demold time. The first two and last two characteristics are related.

Elongation at break is just as it sounds; how much will the silicon stretch before it breaks. This measure is typically presented as a percentage. A low percent stretch is about 250% and a high percent of stretch is 1000%. These percents are not arbitrary, low percent means the mold is more firm and high percent are less firm. Think of this like jelly versus Jell-O. Producing multiple part molds with a high percent stretch is very difficult as it will emphasize part lines in the mold. Part lines occur where multiple part molds meet. These are emphasized as the edges of the mold curl slightly due to the firmness issues. Tear strength is an indication of the force required to tear the rubber, it is measured in pounds per linear inch (pli). The higher the tear strength value the stronger the rubber. Typically higher tear strengths go hand in hand with greater elongation at break



Prototype: Custom prototype element for molding created with sheet styrene.

Throughout this book we have discussed different ways to create custom figures. Once you have created them, how do you display them? Even if you don't have a large selection of custom minifigures perhaps you wish to display your official figures. How can this be done? Well, there are multiple products out there and multiple ways to use them. In this chapter we will visit the ones I am aware of and the ways I use them. I will also disclose a few ideas I have had to create some new options.



LEGO Minifigure Stand



LEGO Sports Plate

Let's begin this review of the available display options by looking at what the LEGO® Group has given us (see left) to use to display our figures. I bet there are more than you realize and these options are typically the ones that best integrate into our LEGO collections. The most recent display stand that LEGO has given us accompanies the new "Minifigures" line. This simple little plate (Tile, Modified 4 x 3 with 4 Studs in Center: www.bricklink.com/catalogItem.asp?P=88646 - see left) which is quite effective for displaying figures and is economically priced around twenty cents on Bricklink.

This plate is also similar to the display plates that LEGO gave us a few years ago. These tiles (Modified 6 x 6 x 2/3 with 4 Studs and Embossed Letters: www.bricklink.com/catalogList.asp?pg=3&catString=38&catType=P&v=2 - see left and below) came with a few sets and had the embossed words "Star Wars," "Sports," "Rock Raiders," "Ninja," or "City." These came in various colors and all but the "Star Wars" versions can be found for pennies on Bricklink making it an economical way to display your figures. This little stand features a card slot which means you could display your figure with a nice little printed backdrop or figure schematic.

When displaying my collection I use many of these stands along with a special board I had made. The plates slide into a special slot cut into the board that makes display shelves for the figures (see right).



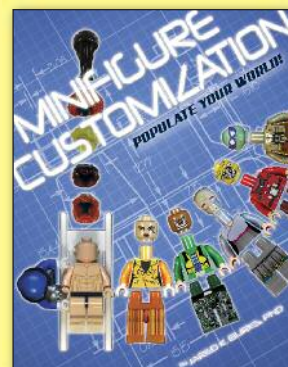
About the Book

Minifigure Customization covers the gamut of topics and techniques used to alter the lovable LEGO minifigure into any character you can imagine. The LEGO Group has based its entire toy line on the concept of creation using the LEGO brick, yet the company gives us a relatively static figure. This book identifies and teaches the skills needed to alter that static figure into any you can "just imagine." We begin the journey into custom figures by defining the hobby of minifigure customization; from there topics spiral down the path of basic purist customization through to complete custom figure creation. This book features tutorials on decal design and application; color alteration; custom part modification and creation; tips on minifigure displays; and digital photography tips to capture your custom figures in the best light. The essential tools used to create custom figures are also identified. The book includes tips and tricks followed by a gallery of some of the best custom figures created. *Why live in the box? Populate your world* with any alien, superhero, historical, action, horror, or science fiction figure you can "just imagine."



The author, Jared K. Burks (known online as Kaminoan), has created thousands of custom figures. He has been creating them for over 13 years and writes a regular column on the subject for *BrickJournal* magazine. His work has also been featured in several other magazines and books including *Standing Small: A Celebration of 30 Years of the LEGO Minifigure*.

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