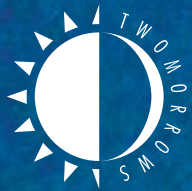


The Magazine for LEGO® Enthusiasts of All Ages!



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Brick Journal

Issue 49 • February 2018
people • building • community

Celebrating 40 Years of TECHNIC!

**Michael Brown's
AH-64 Apache
Helicopter**



**TECHNIC's
Model History**

**MINDSTORMS
Printing Press**

**Instructions
and MORE!**





Brick

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Contents

From the Editor.....2

People

Building WTC1: A New York Icon3

Building

Michael Brown's Apache!8

The LEGO MINDSTORMS Gutenberg
Printing Press.....15

A Visual Tour of the *Khagaan*20

From Spooky to Kooky:
The IDEAS of Hugh Scandrett.....26

40 Years of Technic.....31

BrickNerd's DIY Fan Art:
Expert Builder Car40

Minifigure Customization 101:
The Power of the AFOL Community43

You Can Build It:
MINI Episode VIII Resistance Bomber ...46

Community

Bionicle Chronicle

Barriers: The Brick-built Wall
in our Minds52

Making a MINDSTORMS Lab.....58

Reviewing *The LEGO Trains Book*62

A Review of *Brick Madness*.....65

Postcards from Princess Land66

Who is the LEGObomber?70

Bricks by the Bay72

Community Ads.....78

Last Word.....79

AFOLs80

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Building 1WTC

A New York Icon

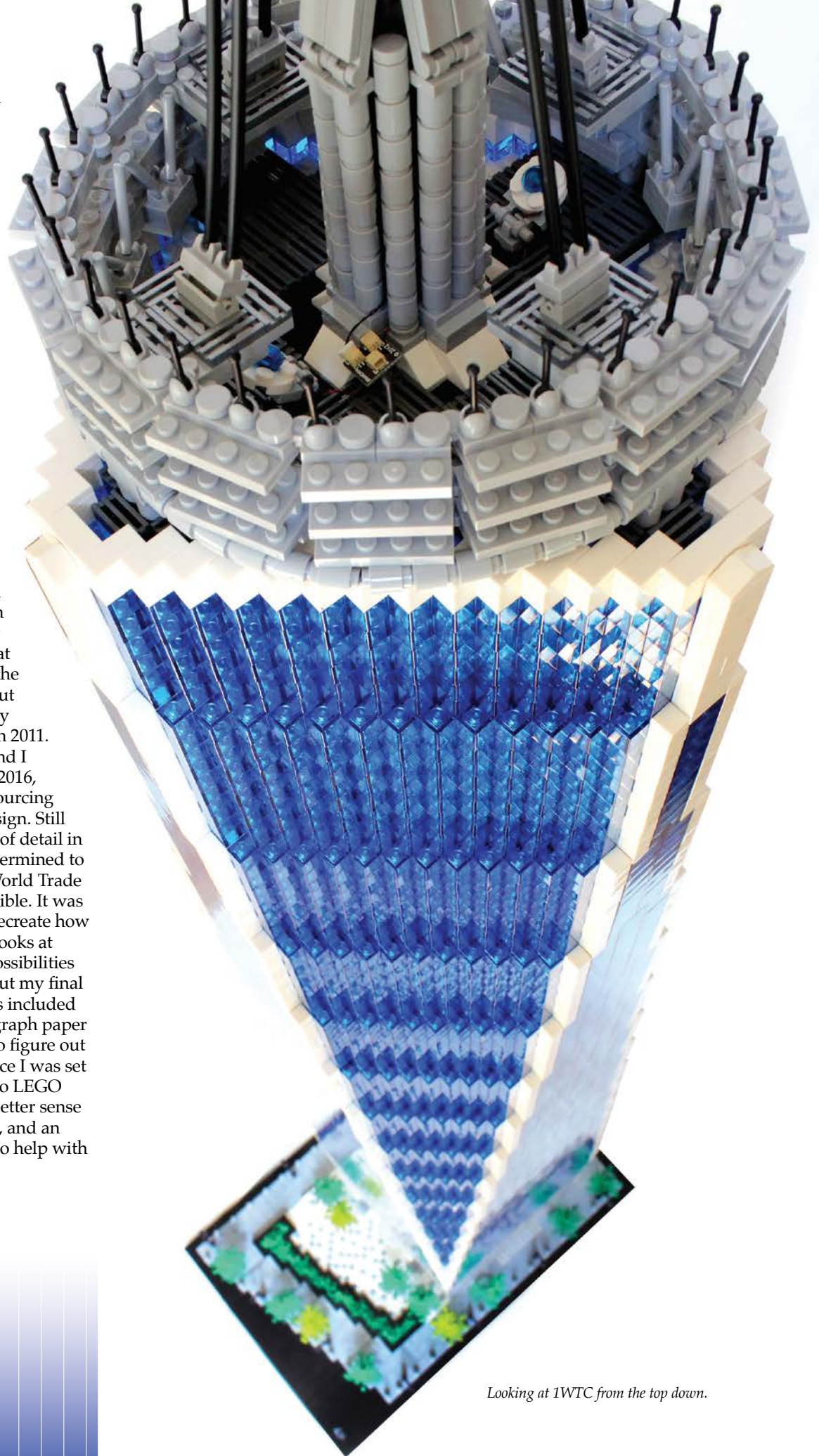
Article by Greg DiNapoli

As a graphic designer and an architectural illustrator, my love of art and architecture can be traced back to my childhood obsession with LEGO bricks. As a child, I was enamored with big structures; whether it was supertall skyscrapers, lighthouses, or huge ships, it was always a dream of mine to build large models of my favorite structures out of LEGO bricks. It was frustrating, however, being limited to the pieces in my collection. While extensive, I never had enough of the right parts to realize my dream. After graduating college and landing my first job with steady income, I discovered bricklink.com and this opened up a world of possibilities I never dreamed of. Suddenly I had access to any piece I could ever want, mostly in large quantities. I immediately decided to try to fulfill my childhood dream and build a large skyscraper. I chose the Sears (now Willis) Tower in Chicago. Completed in 2006, it is about six feet tall and is accurate in proportion, but being my first build in years, it lacked detail. After that, I became busy with my career, marriage and becoming a father, but the desire to build another, more accurate skyscraper never left me.

Living only an hour outside of New York City, I grew up drawn to the Twin Towers. I had such an interest in tall skyscrapers, and there weren't many bigger than them. Watching them collapse during the tragic events of 9/11 was devastating on so many levels, not only because of the unimaginable loss of life, but also from an architectural standpoint. The city had lost an architectural icon, and the hole in skyline was a constant reminder of that awful day.

Greg DiNapoli by his model.

I followed the redevelopment of Ground Zero closely. When the final design for One World Trade Center was released years later, I immediately wanted to recreate it out of LEGO bricks. I was drawn to it for several reasons: First, it meant New York would reclaim America's tallest building. But more importantly, I loved the simple geometric form of the tower, but also its complexity; it changes shape depending on from what angle you look at it. From one angle, it invokes an obelisk similar to the Washington Monument, but at another it actually holds the exact same form as one of the original Twin Tower buildings. I think it is a great memorial to what once stood there, and for the lives lost. I immediately put pencil to paper and did my first design for my build in 2011. Life then got in the way and I had to put it aside, but in 2016, I finally decided to start sourcing pieces and finalizing a design. Still dissatisfied with the level of detail in my Sears Tower, I was determined to make my model of One World Trade Center as accurate as possible. It was also important for me to recreate how One World Trade Center looks at night, so I kept lighting possibilities in my mind as I worked out my final design. My design process included both pencil drawings on graph paper and computer drawings to figure out proportion and shape. Once I was set with a rough idea, I took to LEGO Digital Designer to get a better sense of what it would look like, and an approximate piece count to help with sourcing bricks.



Looking at 1WTC from the top down.

Building



Michael Brown's Apache!

Article by Joe Meno

The first thing you notice about Michael Brown's Apache model is its size. Using a scale larger than minifigure scale, the helicopter replica is over 30 inches long and is primarily made up of LEGO Technic parts. It's the result of years of work by Michael. It looks intimidating in black, until its electrical systems are activated. Then it becomes *stunning*.

The rotors slowly begin to rotate, and lights flare to life under the model. In spite of its size, the model sounds bigger and even meaner. Michael's research with the Apache has been extensive, as his son works on them in the military. From there and Michael's own experience working in the aerospace industry, he has worked to make the Apache as accurate as possible with LEGO elements.

Even at this state, though, he is not finished building—there are some details Michael wants to add to make the model more realistic. In the meantime, here's a look at the model at this point. There's a lot of work that has been done already, and more than enough to examine!

Looking Forward

The front tip of the Apache is where the pilot's night vision and gunner's sensor turret are located. Both the model and the actual chopper can rotate the turrets, but one feature that Michael wants to incorporate is gearing the turret so the underside gun also rotates in unison.

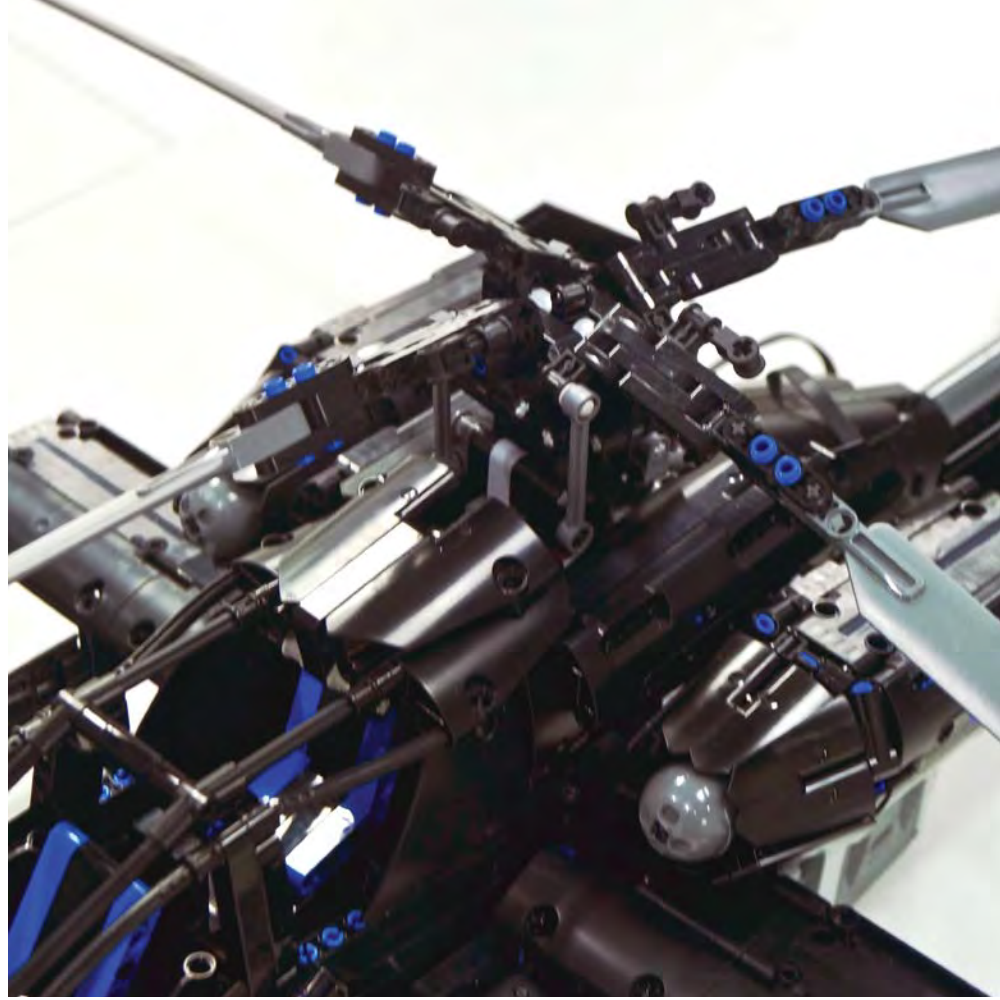
The lights are LEDs that are not LEGO, but from a third-party maker. The tires in the landing gear are also non-LEGO at the moment, as the size is non-standard.

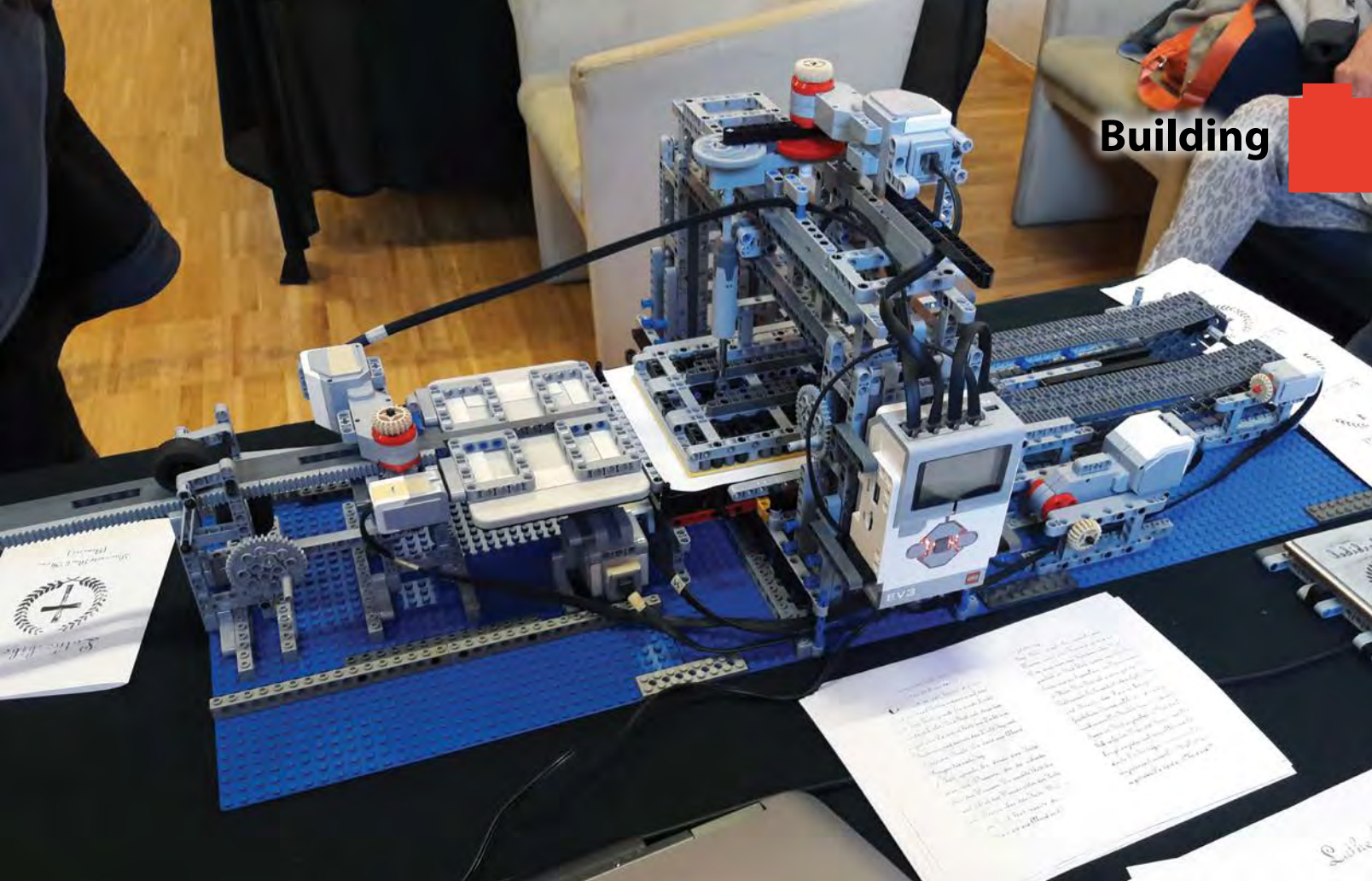


Rotor Control

The rotors are LEGO Technic helicopter blades and are accurate to the Apache's rotors. A closer look reveals that the pitch of the rotors can be controlled like a real helicopter—and the functioning control yoke is in the pilot's position in the cockpit. You can *actually* control the rotors from the cockpit!

Another thing that can be seen here is how Michael used fairings and panels to shape and sculpt the Apache's body. The engine cowlings are fairings that are held together with Technic pins, which makes it easy to remove and access the gears and interior.





The press on display.

The LEGO MINDSTORMS Gutenberg Printing Press

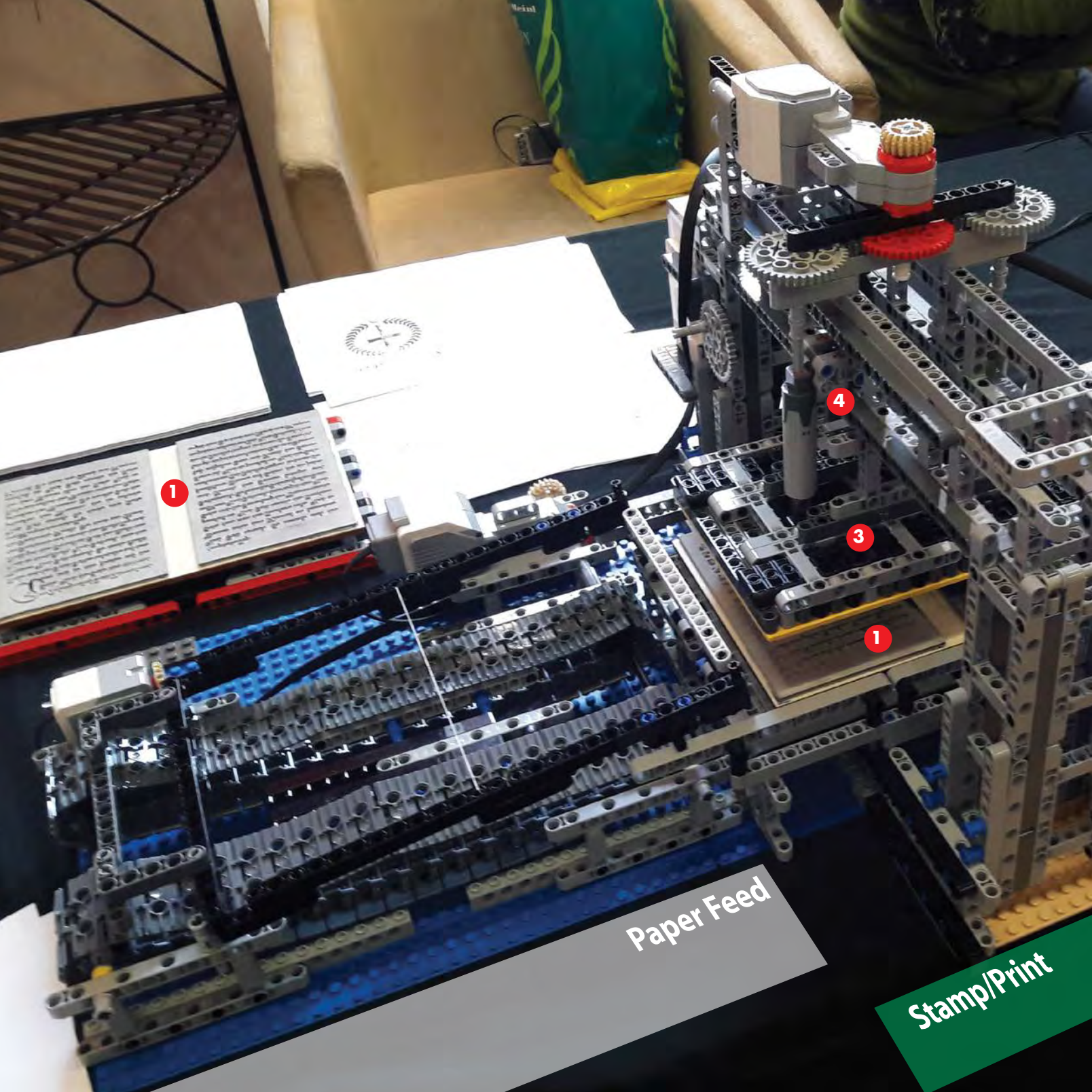
Article by Michael Brandl

During the fall Mike Brandl's LEGO User Group (LUG) has an annual exhibition at a medieval fair in Austria. The motto this year was "500 years Reformation." Thinking of that, the name Gutenberg instantly came to Mike's mind, and with that his famous invention: The Gutenberg printing press. Mike decided then to build a LEGO Mindstorms printing press for the medieval fair and print some small Bibles!

The finished press takes all the motor and data ports from one MINDSTORMS brick, so there are four motors and four sensors used to run the press. Everything to print one side of paper can be done with the program. Here's how it was done.



The printed results.



A full view of the press.

The LEGO MINDSTORMS Gutenberg Printing Press consists of four important parts controlled by a MINDSTORMS EV3 brick. The parts include:

1 Stamps. There are four laser-engraved stamps, as the small bible will have four pages to print. These stamps are mounted on a set of Technic frames so they can easily be exchanged.

2 Paper transport mechanism (shown on photo at top right). A piece of paper (size A5, approximately half of a letter-sized paper) is transported to the stamp. The paper is transported with a frame of Technic beams by chain threads, with sensors used to place the paper accurately.

3 Ink pad. For inking the stamps, the ink pad is mounted on a long beam and can be inserted by a motor inside the printing press.

A Visual Tour of the *Khagaan*

*Article and Photography
by Peer Kreuger*



Khagaan with its support vehicles.

My name is Peer Kreuger, and for my job I work in a warehouse for a medical company. (It inspired me to make my Muravi forklift.) I halfway finished a study in graphic design, and enjoy dissecting art and movies for fun. (This also helps me get inspiration for my own YouTube work.)

I've been building since forever. My dad got me an 8843 forklift when I was five or so (I strongly suspect he bought it for himself, but it eventually ended up in my collection anyway). I had a bit of a Dark Age between 14 and 18, but finding other folks online who were still busy with LEGO quickly ended my misconception that LEGO was just for kids. Going to meetings and connecting with other AFOLs sealed the deal.

Technic is by far my favorite theme, but I always prefer to support it with generous helpings of system bricks. A combo of Model Team and Technic would be ideal for me. Otherwise, LEGO just excels at great themes. Khagaan was an experiment to mix Technic with Space, but other themes like Elves, Racers and Power Miners are interesting as well. I'd be a trainhead if I had the money, time and space.

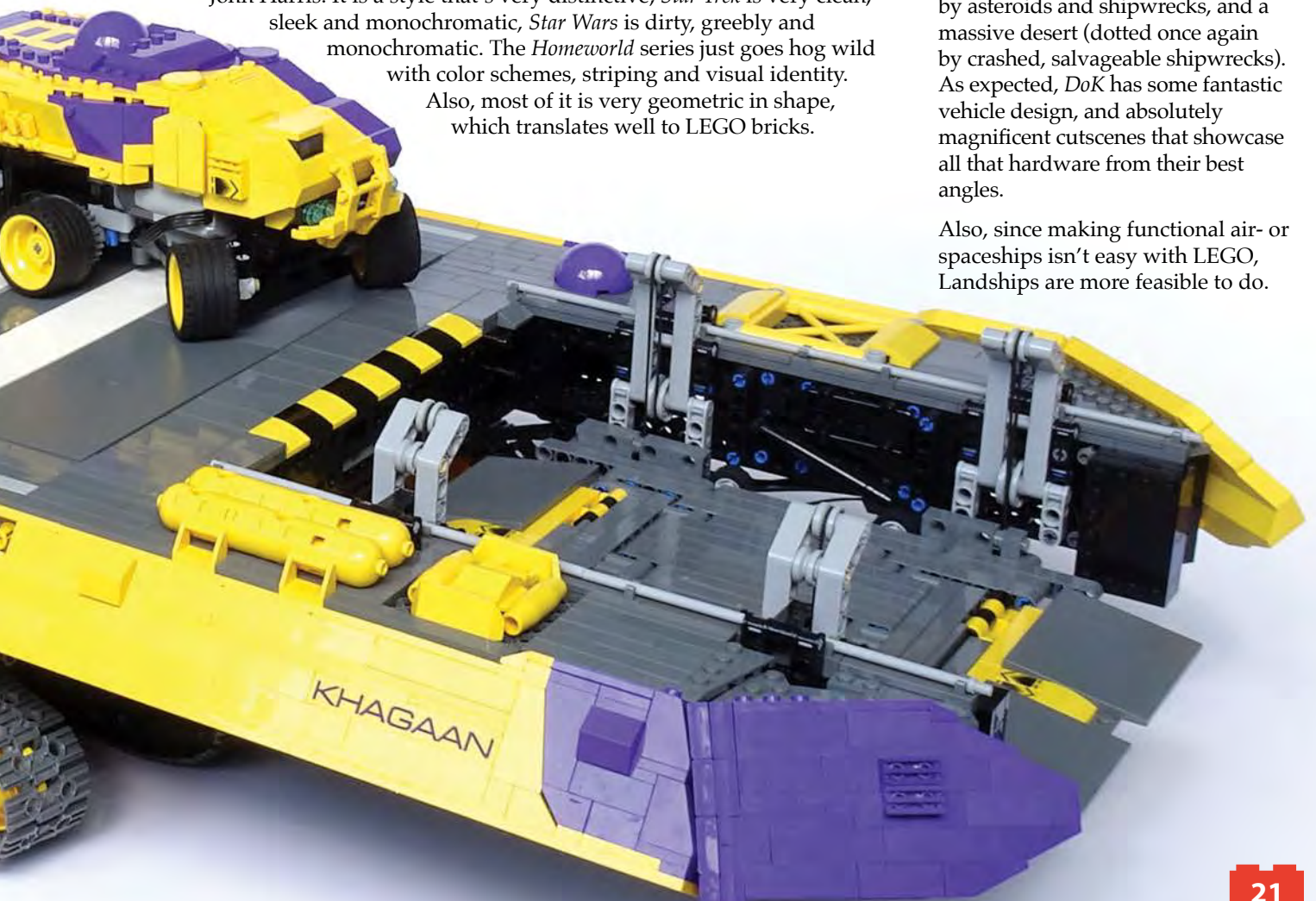
The inspiration for Khagaan and the additional vehicles is from the game "*Homeworld—Deserts of Kharak*." The *Homeworld* series has a massive influence on just about every space builder I know, mainly because it has a very solid graphic identity that in turn was inspired by artists like Chris Foss and John Harris. It is a style that's very distinctive; *Star Trek* is very clean, sleek and monochromatic, *Star Wars* is dirty, greebly and monochromatic. The *Homeworld* series just goes hog wild with color schemes, striping and visual identity. Also, most of it is very geometric in shape, which translates well to LEGO bricks.



Khagaan as seen on YouTube.

The latest iteration of the *Homeworld* series (*Deserts of Kharak*) takes a space-bound RTS game, and since it's a prequel, translates space warfare to mostly land-based combat. There's some interesting parallels between the vast emptiness of space, punctuated by asteroids and shipwrecks, and a massive desert (dotted once again by crashed, salvageable shipwrecks). As expected, *DoK* has some fantastic vehicle design, and absolutely magnificent cutscenes that showcase all that hardware from their best angles.

Also, since making functional air- or spaceships isn't easy with LEGO, Landships are more feasible to do.





The Addams Family Mansion.

From Spooky to Kooky: The IDEAS of Hugh Scandrett

*Article and Photography by
Hugh Scandrett*

Background

As a child in the 1960s, I had lots of LEGO, and always built many things. About four years ago, a friend sponsored a FIRST® LEGO League competition at our work as a team-building activity. About 100 people (ages 20-60) were thrown into a ten-hour, no-preparation event, which culminated in a super friendly and inspiring competition and social event. It was awesome, and it rekindled the LEGO brainwaves in me. About three years ago, after completing the Parisian Restaurant (a personal favorite!), I caught the modular building bug and completed all ten (at the time) of them. Then I built The Tower of Orthanc 10237 to get into the creepy space, and studied the Haunted House 10228 for more building ideas.

Addams Family Mansion

I loved the 1960s TV series *Addams Family* and wanted to do a building that was big and creepy! The mansion is an “end of series” 50th anniversary tribute, coinciding with the April 1966 finale. The Addams Family Mansion consists of three fully detailed floors, and the whole building can be split through the center. Each of the floor segments are removable. The family looks right at home. It took me about six months of studying the old TV series DVDs, trial and error on the greenhouse, and angled corner section, and sourcing the 7,000+ parts. Then it was submitted to LEGO IDEAS and received 10,000 votes of support in June of 2016 and went into LEGO Review. While it was not “approved” into a kit, I enjoyed the experience, and lots of people enjoyed seeing the creation. The Addams Family Mansion can be found here: <https://ideas.lego.com/projects/b0a40865-77f1-4c04-9d89-53ff8a754c3d>

The project was a challenge because it was my first MOC. There was lots to learn about translating an idea into large implementation and lots of building and rebuilding. There was lots of learning the better way to do something right. I did the project freehand, from looking at several source materials, mostly screen captures from the original TV series on DVD and one fictional sketch of the rear of the mansion (never shown on TV) that I found. I had no LDD file or drawings.

I started by prototyping the greenhouse, portico and the 45-degree front corner of the mansion. With solid designs of those, I could layout the whole footprint, and determine baseplate needs. There are over 7,000 pieces in the build, so sourcing was one of the toughest parts of this project.

Also, the amount of detail presented a challenge. Among the many aspects, the mansion features full tile carpeting throughout, a glass greenhouse at the rear, and a whole host of furnishings such as suits of armor, taxidermy, and a bed of nails. All the ceilings are finished with inverted tiles. You can also find the family automobile out front and all of the Addams Family members as minifigures including Lurch, Thing and Cousin It (added using hair from Gloin/Hobbit).

The Addams Family Mansion consists of three fully detailed floors and the whole building can be split through the center on a pivot hinge; each of the floor segments are removable allowing for easy access and imaginative play. The front view of the mansion includes the grand portico and Addams Family car.

Nighttime shots of the LEGO Addams Family Mansion with interior lighting using Brickstuff components can be found on Flickr at: <https://www.flickr.com/photos/140336078@N03/sets/72157665021280493>

The cast, from left to right: Morticia, Gomez, Wednesday, Pugsley, Uncle Fester, Grandmama, Cousin It, and Lurch.



Above and below: Some interior sections of the mansion.



The mansion lit up.





Years of Technic

Timelines compiled by Geoff Gray

“When the LEGO Group released the first ‘Technical Set’ in 1977, new elements were added to reproduce realistic technical functions. The beams and plates, gears, axles, connectors and special parts, wheels and tires that were part of Technic were all new in 1977, and all were a result of the approach to model building taken by Jan Ryaa and Erik Bach.”

Quote taken from the LEGO Technic website (<https://www.lego.com/en-gb/technic/history-page/stories/the-beginning>).

40 years ago, The LEGO Group introduced a new line of sets called TECHNIC. The line offered builders more options for creating large “technical” models and spawned an explosion of creativity and education never before seen in a toy. Forty years later, the line is as strong as ever. Models released by the company have included features like realistic internal combustion engines, fully functional differentials, fully functional transmission assemblies, rack and pinion steering, operational wishbone suspensions, steering wheel paddle shifters (on the Porsche 911) and more. They added pneumatics to the line to allow for simulation of hydraulic machinery, then augmented the hydraulics with things like linear actuators that allow for much stronger torque application. They introduced flex cable systems to allow for transmission of motion through cabling (a principle used in bicycles for the brakes and the gear shifters). They added (and continue to add) a variety of motors, gears and connectors to the line. They started adding automated control through various programmable bricks (more information at the end of this article) which led to a whole new revolution of designs.

To honor the TECHNIC line, I have chosen a set and one or more elements from each year of the product line to show in the timeline. There is no particular reason for each of the items I chose except that maybe I have found the set or elements particularly useful or interesting. Unless otherwise noted, I used the Bricklink inventory database to verify the release dates. All of the parts images were created by me using LDraw. All of the set images are copyright of The LEGO Group.



In honor of the 40th anniversary of the Technic line, The LEGO Group created instructions for this go-kart that you can build from the parts of three sets (42063, 42061 and 42057). You can download the instructions from the LEGO website.

Built With Technic—A Babbage Difference Engine

Andrew Carol built a machine for calculating polynomial functions mechanically, known as a difference engine. (If you watched the movie “Hidden Figures,” the work that the “calculators” did for NASA is a good example of the type of calculations that difference engines were originally trying to make easier.)

This working engine was built completely out of LEGO and LEGO Technic pieces. You can read all about it on his site: <http://acarol.woz.org/LegoDifferenceEngine.html>.



This picture shows some of the details of a Babbage Difference Machine designed and built by Andrew Carol. The inset shows the entire machine.



1977
853 Auto Chassis

1978
854 Go Kart

1979
951 Bulldozer

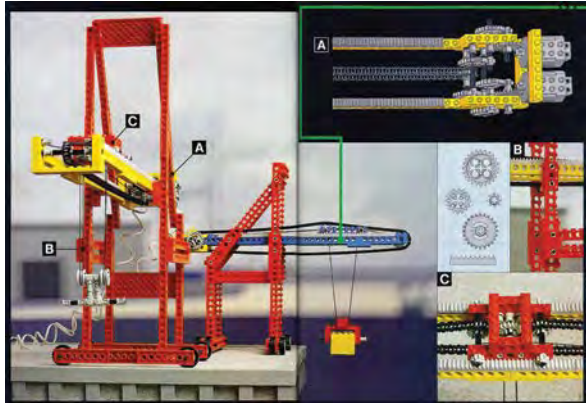
1980
8858 Auto Engines

1981
8859 Tractor

Technic Idea Books



Book Number	Year	Page Count
8888	1980	100 pages (including covers)
8889	1984	116 pages (including covers)
8890	1988	52 pages (including covers)
8891	1991	100 pages (including covers)



Here is a spread from the first book (#8888) showing the mechanics of a crane.

The covers of the four Technic Idea Books



1997
8479 Barcode Multi Set



1999
8448 Super Street Sensation



2001
8466 4X4 Off Roader

1998
8482 Cybermaster

2000
8002 Destroyer Droid




Expert Builder Car

Design and Instructions
by Tommy Williamson



About this issue's model:

I was lucky enough to be the perfect age when LEGO Technic was introduced, or as it was called back then, "Expert Builder." I never got the classic 8860 Auto Chassis, but my friend Sean had it and we occupied ourselves for hours with it. It is an absolute classic, and when I thought about what I might want to design for this Technic issue, this was the first thing I thought of—enjoy! 



Tommy Williamson is no stranger to *BrickJournal*, having been featured previously for his Jack Sparrow miniland scale figure. Since then, he has gone farther into building, making some remarkable *Star Trek* props and other models. He's now doing a column for *BrickJournal*: DIY Fan Art. Here, Tommy

takes a little time out from his busy schedule at BrickNerd.com to make a model of his choosing for the magazine.

Parts List (Parts can be ordered through Bricklink.com by searching by part number and color)

Qty	Part	Color	Description
4	3022.dat	Red	Plate 2 x 2
5	3023.dat	Red	Plate 1 x 2
2	48336.dat	Red	Plate 1 x 2 with Handle Type 2
2	60470a.dat	Red	Plate 1 x 2 with 2 Clips Horizontal (Open U-Clips)
1	3839b.dat	Yellow	Plate 1 x 2 with Handles Type 2
1	2445.dat	Black	Plate 2 x 12
2	2926.dat	Black	Plate 1 x 4 with Wheels Holder
2	3020.dat	Black	Plate 2 x 4
1	3023.dat	Black	Plate 1 x 2
1	3032.dat	Black	Plate 4 x 6
1	3068b.dat	Black	Tile 2 x 2 with Groove
6	3794a.dat	Black	Plate 1 x 2 without Groove with 1 Centre Stud
1	3829c01.dat	Black	Car Steering Stand and Wheel (Complete)
1	3839b.dat	Black	Plate 1 x 2 with Handles Type 2
1	3937.dat	Black	Hinge 1 x 2 Base
1	6134.dat	Black	Hinge 2 x 2 Top
4	51011.dat	Black	Tyre 6.4/ 75 x 8 Shallow Offset Tread
1	51739.dat	Black	Wing 2 x 4
1	99780.dat	Black	Bracket 1 x 2 - 1 x 2 Up
2	2412b.dat	Light Bluish Gray	Tile 1 x 2 Grille with Groove
2	2420.dat	Light Bluish Gray	Plate 2 x 2 Corner
1	2436a.dat	Light Bluish Gray	Bracket 1 x 2 - 1 x 4 with Square Corners
1	3020.dat	Light Bluish Gray	Plate 2 x 4
2	3023.dat	Light Bluish Gray	Plate 1 x 2
2	3710.dat	Light Bluish Gray	Plate 1 x 4
4	50944.dat	Light Bluish Gray	Wheel Rim 6.4 x 11 with 5 Spokes
2	85984.dat	Light Bluish Gray	Slope Brick 31 1 x 2 x 0.667
1	3710.dat	Blue	Plate 1 x 4
2	3794a.dat	Blue	Plate 1 x 2 without Groove with 1 Centre Stud
4	4070.dat	Blue	Brick 1 x 1 with Headlight
2	3666.dat	Dark Purple	Plate 1 x 6

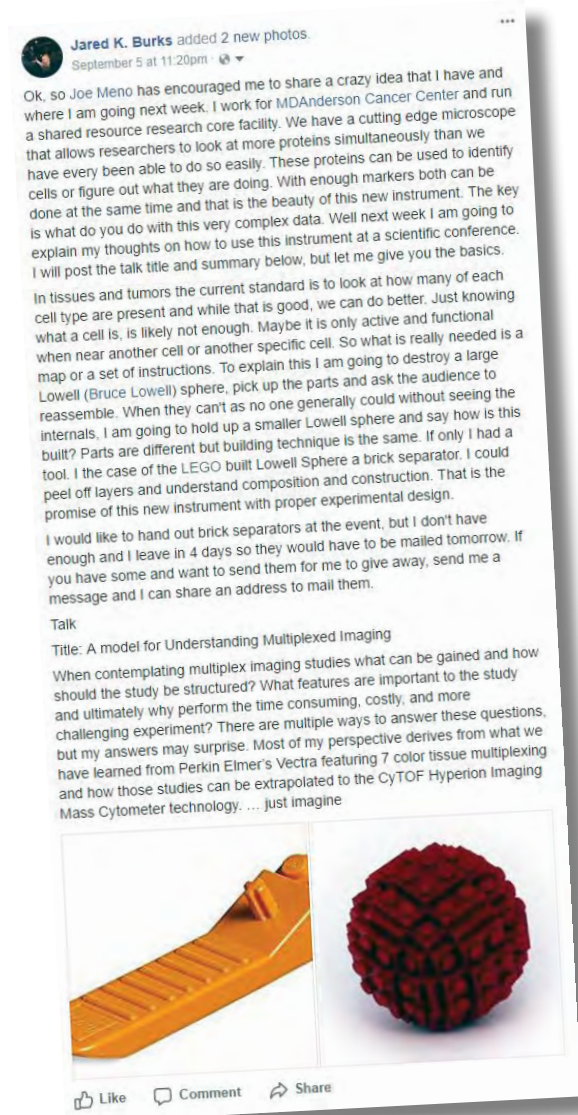
Minifig Customization 101

The Power of the AFOL Community

Article and Photography
by Jared K. Burks



The ubiquitous brick separator.



Jared's post on Facebook.

I am going to depart from my typical column on custom minifigures to discuss my professional life and a recent experience with the power of the AFOL community. I am writing this article as a thank you to the AFOLs who assisted me and to explain the power of the brick.

I live in Houston, Texas, where I work for a well-known Cancer Center helping to operate a large research core facility. Core facilities are shared resource facilities where large equipment that is either too difficult or too expensive for individual research labs to operate or maintain are centralized. These are shared amongst all researchers at the Institution. Technology experts operate and assist researchers from the entire medical center (which is composed of many local institutions) and even some researchers outside the state. As I mentioned before, this facility is strictly for researching cancer.

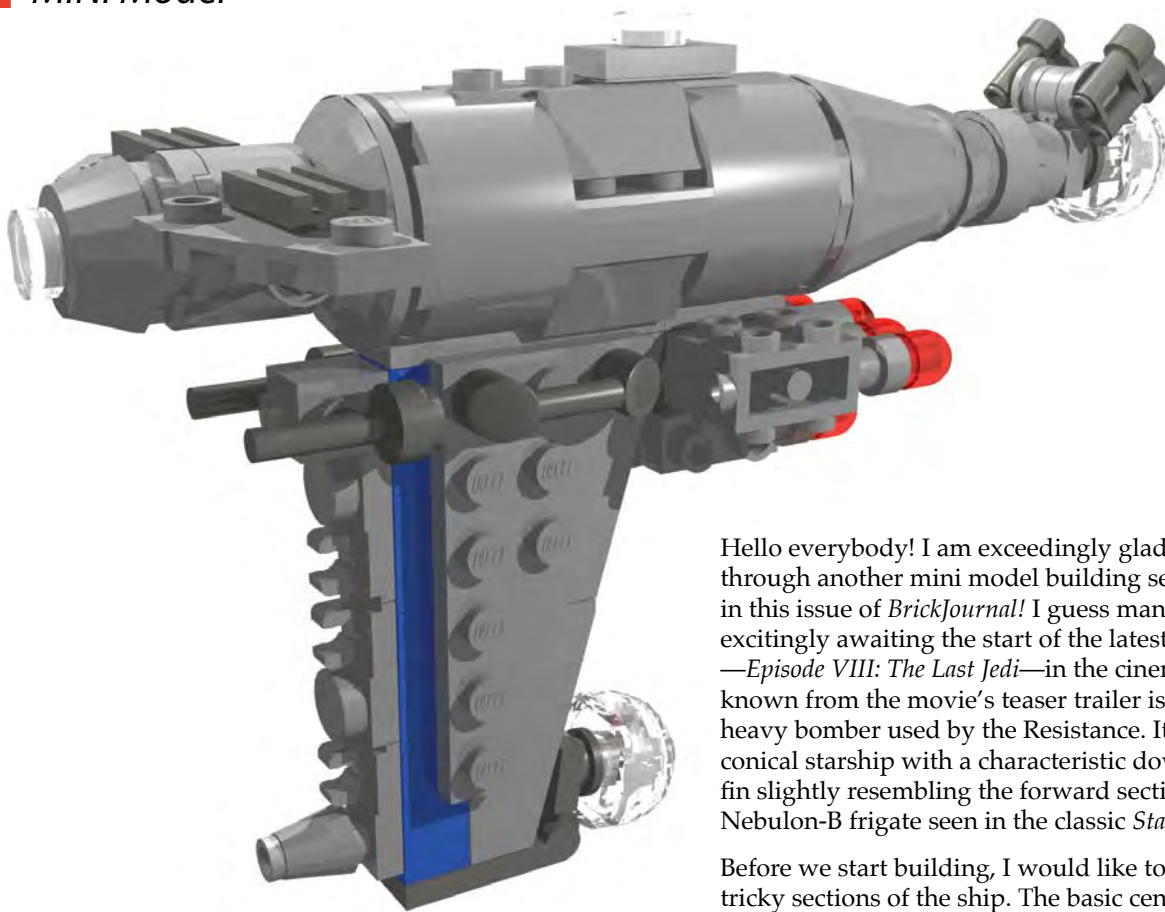
I am getting a bit ahead of myself at this point though. Houston was struck by Hurricane Harvey and as a result, my home was inundated with about two feet of water from the rainfall delivered by the storm. This event started on the morning of August 27th and has affected my life ever since. My family is completely safe, everyone is healthy, and as of the writing of this article, we are still in temporary housing but hope to move to a house by the end of October.

On September 5th, I was talking to Joe Meno (*BrickJournal* editor) about the flooding and article deadlines for the magazine—while disasters may happen, life and deadlines march on. I had already chatted with a few customizers who would be willing to fill in for me. As the conversation progressed, I mentioned to Joe a professional presentation I was about to give at an upcoming meeting in Europe.

I was going to use a LEGO model to explain my logic behind why to use a very specific innovative technology and why scientifically it is critical to ask questions in this manner. In order to complete this example I wanted to hand out LEGO brick separators as an analogy to this technology.

You Can Build It

MINI Model




MINI Episode VIII Resistance Bomber

*Design and Instructions
by Christopher Deck*

Hello everybody! I am exceedingly glad to guide you through another mini model building session featured in this issue of *BrickJournal*! I guess many of you are excitedly awaiting the start of the latest *Star Wars* movie—*Episode VIII: The Last Jedi*—in the cinemas. Already known from the movie's teaser trailer is the B/SF-17 heavy bomber used by the Resistance. It's a cylindrical/conical starship with a characteristic downwards oriented fin slightly resembling the forward section of the famous *Nebulon-B* frigate seen in the classic *Star Wars* trilogy.

Before we start building, I would like to highlight a few tricky sections of the ship. The basic center shape is a cylinder for which we chose a big three-wide cylinder piece usually used as engines in official LEGO sets. The conical tailing towards the rear of the ship is very shallow. We cannot use a simple 2x2x2 cone on top of the truncated 3x3x2 cone piece. Instead we use two more truncated cone pieces attached to it.

To attach the small wing on the forward cockpit cylinder we are grateful to finally have a 2x2x1 round brick with two Technic pin holes on two opposite sides. Let's finally take a look at the engine block. To align five of the six engines in one row as narrowly as possible, we use the old 1x2x2/3 bricks which first appeared in the space sets from 1985. Attaching two of these is possible but will generate to neighboring studs with less width than two standard studs, but still allows for the attachment light cover pieces which are smaller than a 1x1 round element.

Now get your bricks, and happy building! See you next time in a *BrickJournal* near you! 



Barriers: The Brick-Built Wall in our Minds!

Article by Dave Foreman

Photography by Molly Raye

LEGO is a fantastic toy, and even more amazing art medium with boundless possibilities. LEGO does one thing very well though, that perhaps isn't always a net positive: It constructs really well. And one of those things LEGO tends to build is mental barriers. The divide between AFOLs who build with system and those like myself who build with construction is a great example. SNOT (Studs Not On Top) is still to this day a difficult concept for some MOCers to grasp even though its proliferation is seen at all levels of LEGO set buying, from a small Polybag like *Colt's Mech* up to the big giant mega sets. Some builders just can't seem to wrap their minds around the idea. Classes, tutorials, building techniques, these are all things that help us break down the mental barriers in our minds that have been put in place.

How did they get there, those barriers we have to overcome in our minds? One could speculate on the many possible reasons but I will offer my own. First, that's just how the mind works. Our brains like to put things into containers or filing systems for future reference. So you could argue that it's just biology. Secondly, I think it has to do a lot with how we are introduced to and experience LEGO on a regular basis. Most FOLs buy LEGO sets with instructions which tell you how to build the set itself. LEGO has a very rigid structure in its design of play, and they seldom break those rules for themselves, even though FOLs don't adhere to them much, if at all. We've all seen that varying degree of what a builder will do to get the results they want out of



Dave Foreman: *How did you get into LEGO, what is an early experience you had with LEGO?*

Molly Raye: Like many other things, I first encountered LEGO as a hand-me-down toy from my older sister. Because she is 11 years my senior, many of the pieces and minifigures were from early '80s to mid '90s sets. They were mostly space themes, with a dash of Fabuland, Aquazone, and Castle. Because she total and the instructions were long gone using the pieces to build my own tion my drive to collect more piece more things. Not long after becoming LEGO as a child, my family adopted often play with and run off with m up naming the cat LEGO as a result memories of the toy involve chasing he stole my LEGO.

How do you overcome mental barriers?

Molly: The two personal barriers I would be "lack of inspiration" and own worst critic. For the first, even force myself to take a break, and try that might inspire new ideas from trying to force myself to build something only results in frustration. So I might instead play a new video game, or that, by the end of the experience, I nite some new ideas. For the latter, harshly critiquing my own work, i

Endeavor the Mad

Fearsome dragon warrior who craves power and status. Built by Molly Raye.

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BRICKJOURNAL #49

40th ANNIVERSARY OF LEGO TECHNIC! GEOFF GRAY explores Technic history, JOE MENO interviews former LEGO Set Designer SOREN HOLM about the classic Technic Space Shuttle, MICHAEL BROWN shows off his Technic-scale AH-64, and more! Plus: Minifigure customizing from JARED K. BURKS', step-by-step "You Can Build It" instructions by CHRISTOPHER DECK, Brick-Nerd's DIY Fan Art, & more!

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