The Magazine for LEGO® Enthusiasts of All Ages!

TWOMORROWS

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Brick Journal

Issue 33 • March 2015

people • building • community

The Robots are Coming!

Builders:
Marc-Andre Bazergui
Andy Milluzzi

LEGO Designer
Lee Magpili

LEGO IDEAS

Sean Kenney

Instructions AND MORE!

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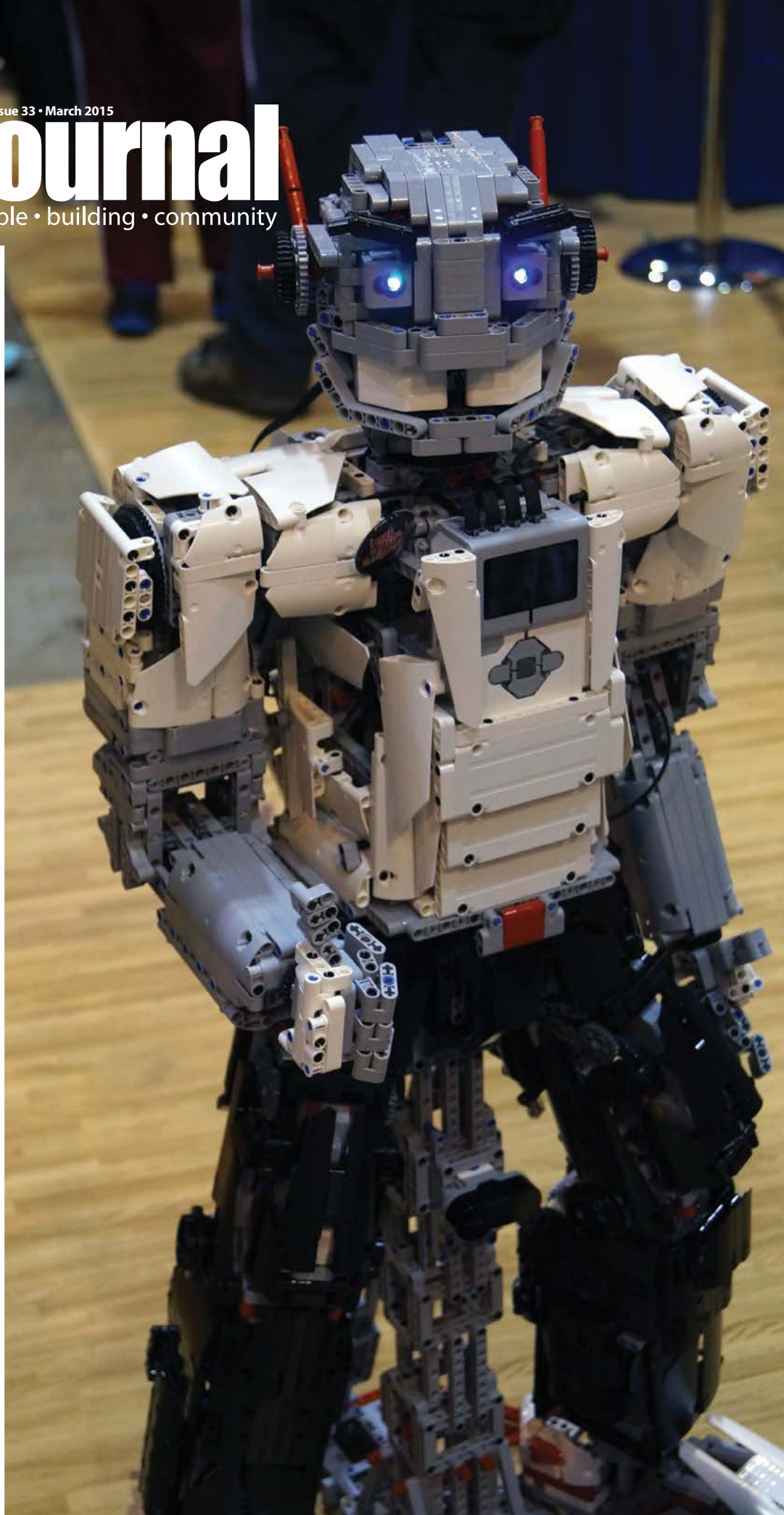

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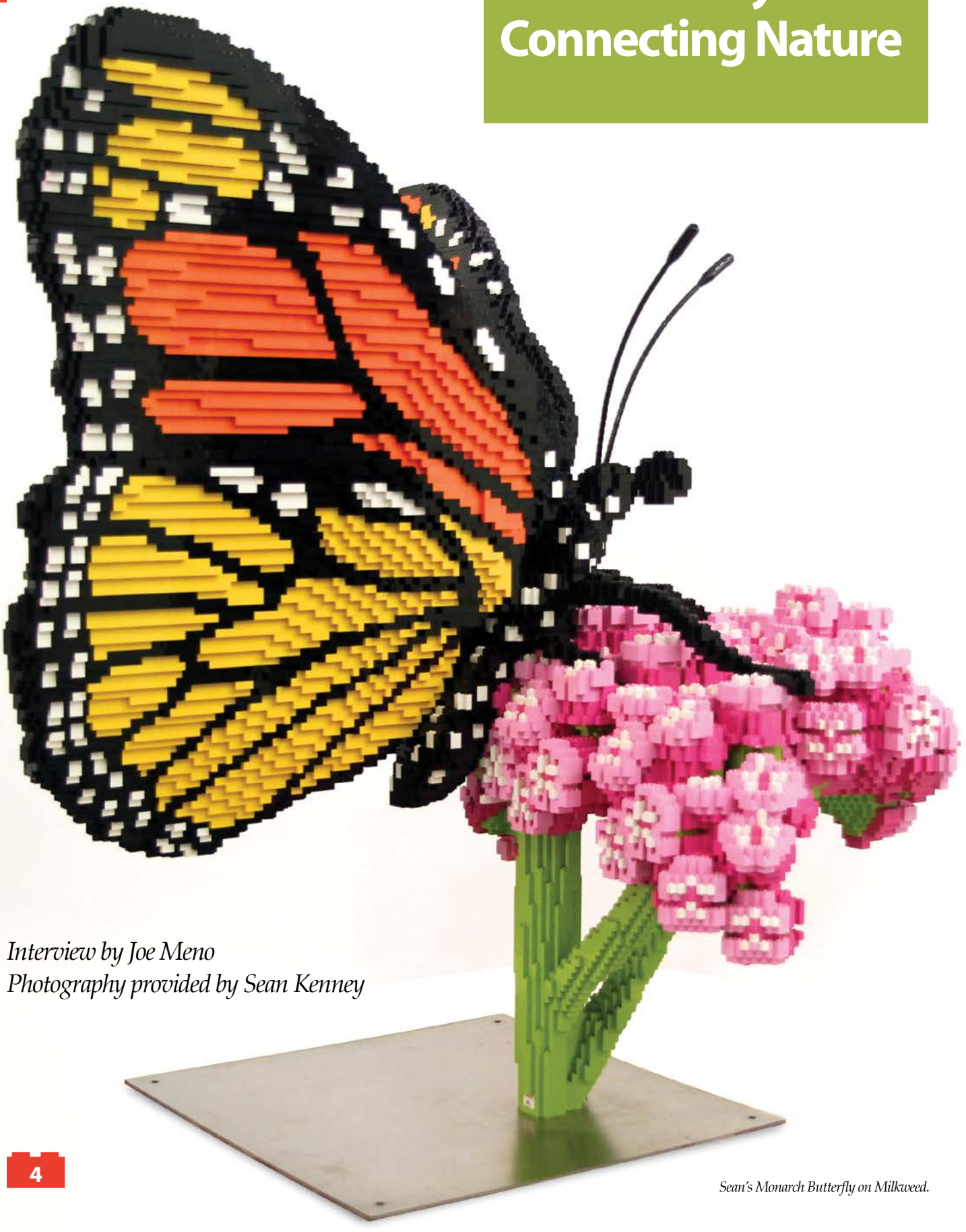
What is FIRST® LEGO® League?

FIRST LEGO League introduces students in grades 4-8 to real-world engineering challenges by building LEGO-based robots to complete tasks on a thematic playing surface. Teams, guided by their imaginations and adult coaches, discover exciting career possibilities and, through the process, learn to make positive contributions to society. Go to http://www.usfirst.org/roboticsprograms/fll *to get involved.*

Sean Kenney: Connecting Nature



Interview by Joe Meno
Photography provided by Sean Kenney

Sean's Monarch Butterfly on Milkweed.

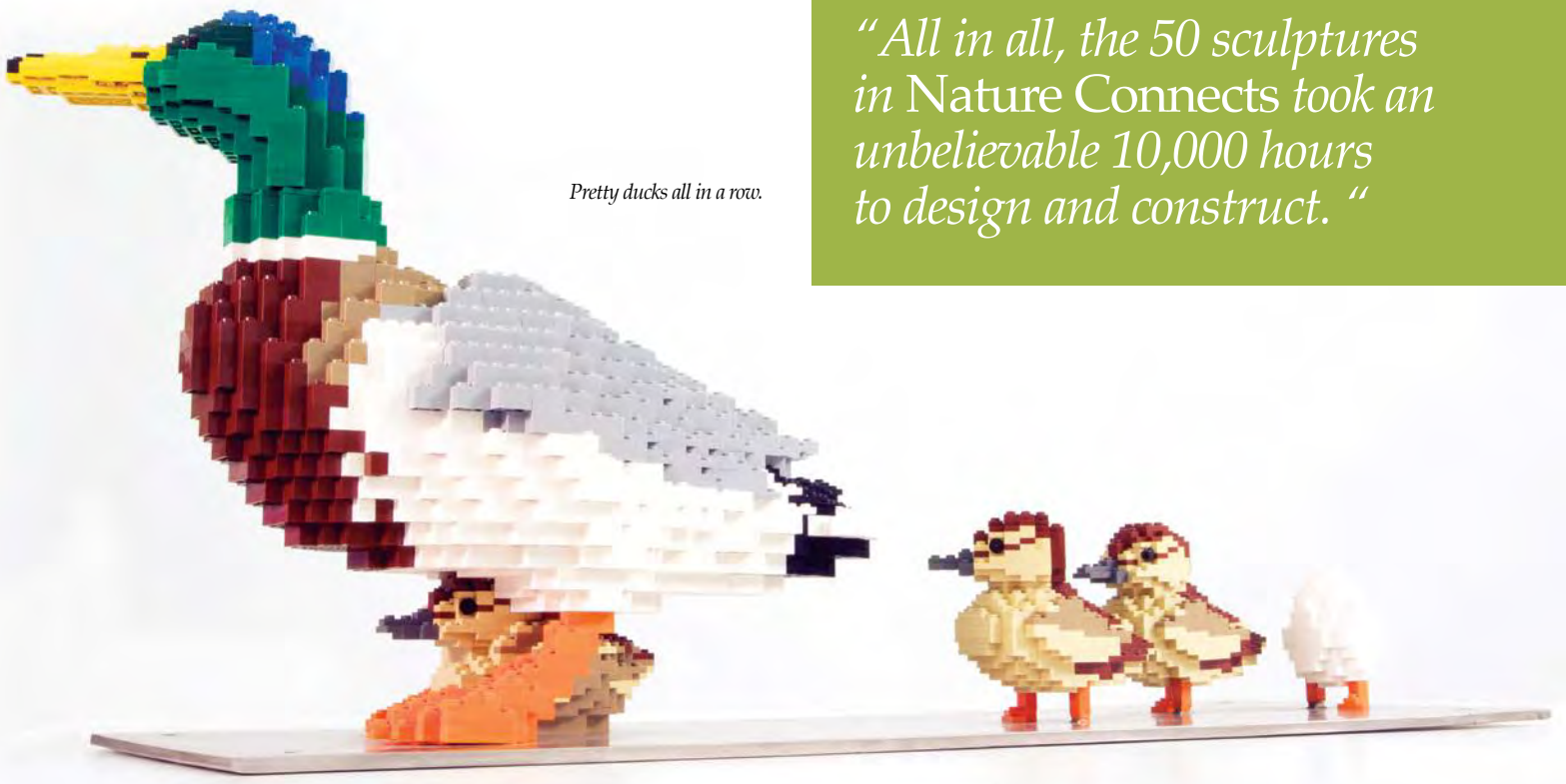
Sean Kenney is one of just a dozen people worldwide who build LEGO models professionally via a program run by The LEGO Group called "LEGO Certified Professionals". For the past 10 years, Sean has built many large-scale models for clients around the world. One of his most recent works is a display that is currently touring the United States, *Nature Connects*. *BrickJournal* talked to him about the display before the Christmas holiday.

BrickJournal: ***Who inspired you to build*** **Nature Connects?**
Sean Kenney: The show was developed in conjunction with Iowa State University's Reiman Gardens in 2011 and has been on tour since early 2012. Teresa McLaughlin, the director of the gardens, initially contacted me with the idea of producing a large outdoor display for their garden, but after lengthy discussion we came up with the idea of instead having the show tour gardens all around the world. Selecting the individual sculptures themselves are all a collaborative effort between myself, Teresa, as well as garden staff and other experts in the field of botany, insects, and animals.

Fundamentally the show is about connections. Much as LEGO pieces connect, everything in Nature is connected in an intricate balance. It is important to me that each individual sculpture attempt to illustrate some of these "connections" found in nature, whether it's a fox hunting a rabbit, a hummingbird feeding on a trumpet flower, baby ducklings following their parents on a walk, or squirrels raiding a bird feeder as the birds stand by helpless to stop them. Others showcase the beauty of nature, like a giant 7-foot-tall rose or a 5-foot preying mantis. There's also a life-sized lawn mower that visitors often mistake for the real thing... which is good for a laugh, but also shows humankind's connection to nature.

I love the way the exhibit has come out; it's really exactly how I imagined it. Seeing a sculpture installed at the botanical gardens, set outdoors and in a bed of tulips really makes the piece shine. It's nice to see a work like this be given a proper presentation.

"All in all, the 50 sculptures in Nature Connects *took an unbelievable 10,000 hours to design and construct."*



Pretty ducks all in a row.

Brian's model Siege Knightmare with motorized cannon hands.

Brian Cooper: Building Robots Big and Small

Interview by Joe Meno
Photography by Brian Cooper and Joe Meno

Brian's Millennium Falcon.

Brian Cooper is a builder that has been around for over a decade building and displaying his models. His online name is Klaupacius and is also known for creating and releasing the instructions to the Teknomeka, a large-scale mecha frame that can be customized for many different looks. He's also done robotics and remote control LEGO models, so he was a good fit for this issue of *BrickJournal*. He took time out to talk to us.

BrickJournal: ***I know that you are one of the first-generation builders, as I went to your Brickshelf gallery online and remember the Dropsheep and the Explorovore models posted on LUGNET (www.lugnet.com). When did you start building and what was your first MOC?***
Brian Cooper: My first LUGNET MOC was a *Millennium Falcon* model I made in 2000, but I'd been building sci-fi and anime themed MOCs for many years before that. Since the late '70s, Classic Space and Technic sets provided the primary construction materials for countless space ships and giant robots. I would generally incorporate mechanisms in all my builds, not just gears for robot joints, but spacecraft with rack-and-pinion operated airlock doors and other mechanisms for boarding ramps, flight control surfaces, etc... I called it "mechanical intrigue", details that made a MOC more realistic to me. The *Millennium Falcon* had electric minimotor-operated landing gear, seemingly excessive, but it was just a longstanding tradition.

Like other people, I had a "dark age" away from building through college and my first job, but I got back into LEGO with the introduction of the LEGO MINDSTORMS set in 1998, due to its synergy of computer programming and Technic model engineering. I built a series of autonomous battle bots

R2-EV3, WALL-EV3, and EV3RSTORM on display.

Making R2-EV3:

Building the LEGO Astromech Using MINDSTORMS

Article and Photography by Marc-André Bazergui (Baz)

Marc-Andre Bazergui is one of the most well-known MINDSTORMS builders in the world having built a large WALL•E robot that has been shown at events worldwide. He is also a member of the MCP—the MINDSTORMS Community Partners, which is a small group of LEGO robotics builders that work with the company at events. Some of his work can be seen online and in the packaging of the LEGO MINDSTORMS set.

Since WALL•E, he has been working on another project that has been seen now in the past few months—a working R2-D2 that uses only MINDSTORMS and LEGO elements. This wasn't an easy project, and here, Baz (as he is known by his friends and fans) talks to BrickJournal about how he built his R2 unit.

After having so much fun and making so many people happy with my latest creation — the transforming WALL•E5 — I started looking for something new that might get the same instant recognition from the public. A Dalek model I built was not it (I guess being Dr. Who's and the human race's worst enemy wasn't helpful)—I needed something more lovable. It became clear: I needed to build an R2-D2 model.

Starting a Droid Factory

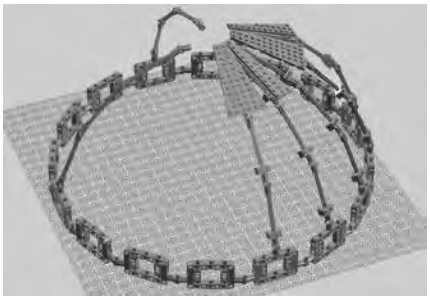
Admittedly, Artoo turns out to be my favorite character in the *Star Wars* movies, and I've been thinking about building him for a while. Since 2012, I have been pushing the idea to build a large-scale transforming R2-D2, using a network of NXT MINDSTORMS programming bricks connected by a Dexter Industries XBee controller. It was also going to be a joint venture between several MCP (MINDSTORMS Community Partners) around the world. I had Mark Crosbie working on programming, Eric Steenstra sharing his Meccanum wheels, Vassilis Chryssanthakopoulos sharing his omniwheel design, and Jildert De Wachter and Mathieu Pedneault helping with other structural concepts. All of the discussions and design were going on via a Facebook group and occasional Google hangouts.

This was going to be the most awesome R2 ever. I gathered all the LEGO parts I needed to start prototyping and built the skeleton far enough to start testing the leg movement for the transform from two legs to three legs. By the middle of Summer 2012, however, I discovered that the R2 unit was so big and heavy that it was collapsing under its own weight. The shoulders would not hold, even after using some techniques from some of the best MINDSTORMS builders in the world! Discouraged, I put this project aside.

Around this time, the MCP was getting more and more involved in the imminent launch of the MINDSTORMS EV3 set. I realized that making a NXT show robot wasn't a good idea, as the MCP were already getting pre-production equipment and being asked to design bonus robots for the new system.

I posted the following message on our Facebook group: "Hi all, a little update. I'm afraid the current idea for the R2-D2 has failed. I am now rethinking it from the ground up. Remember when I was presenting two possible sizes (the 9L and 7L dome)? Well, I believe the logical solution now is to start looking at a smaller scale robot and doing it full EV3." I also set up a building session with my friend Mathieu Pedneault in August 2013. With his arrival, we would try and build the new smaller scale R2-D2.

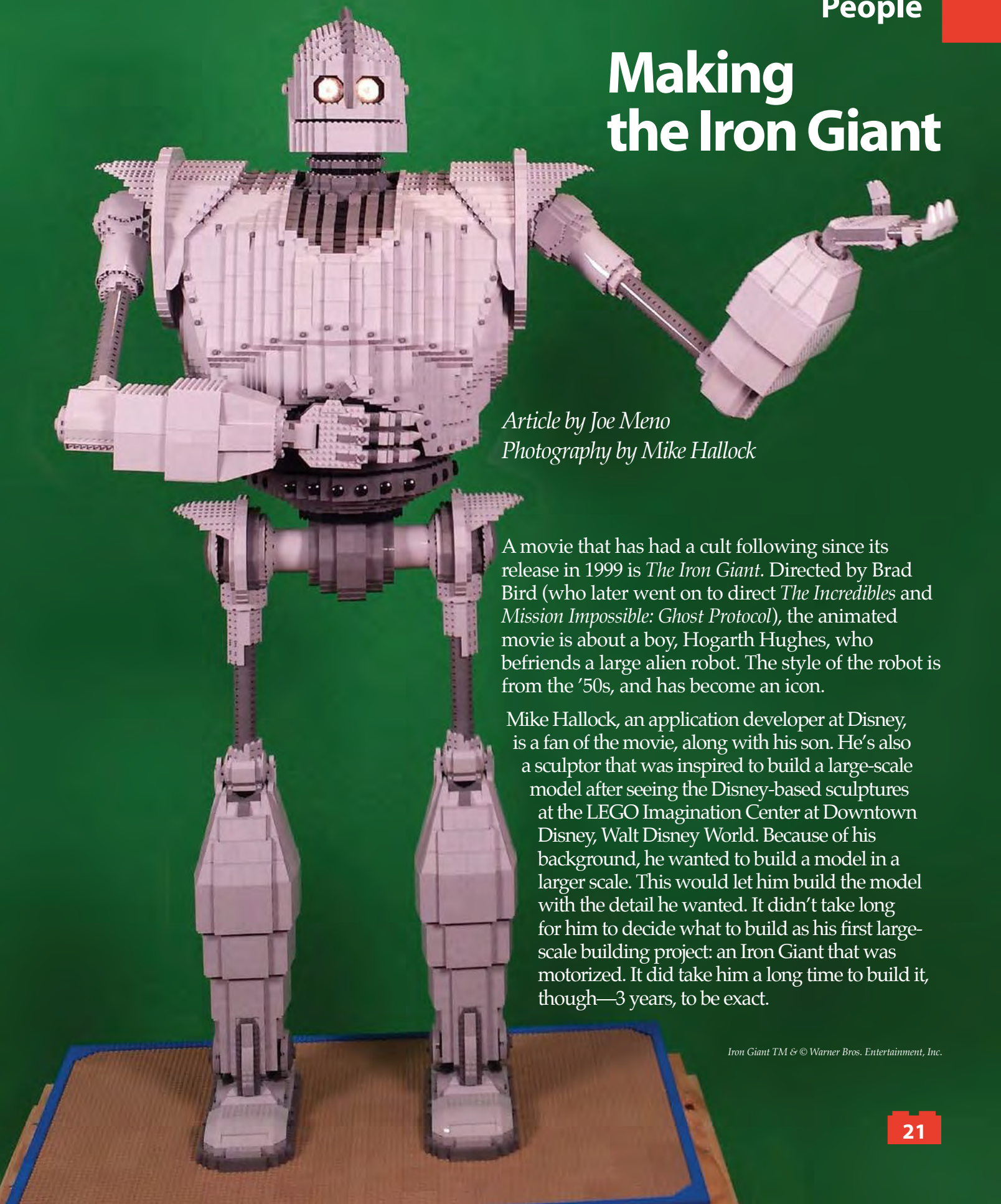
Initial prototyping for the large-scale R2 unit.



The head dome was designed first on LEGO Digital Designer.

R2 in one of its final iterations before its scale was changed. At this time, the EV3 was just launched.

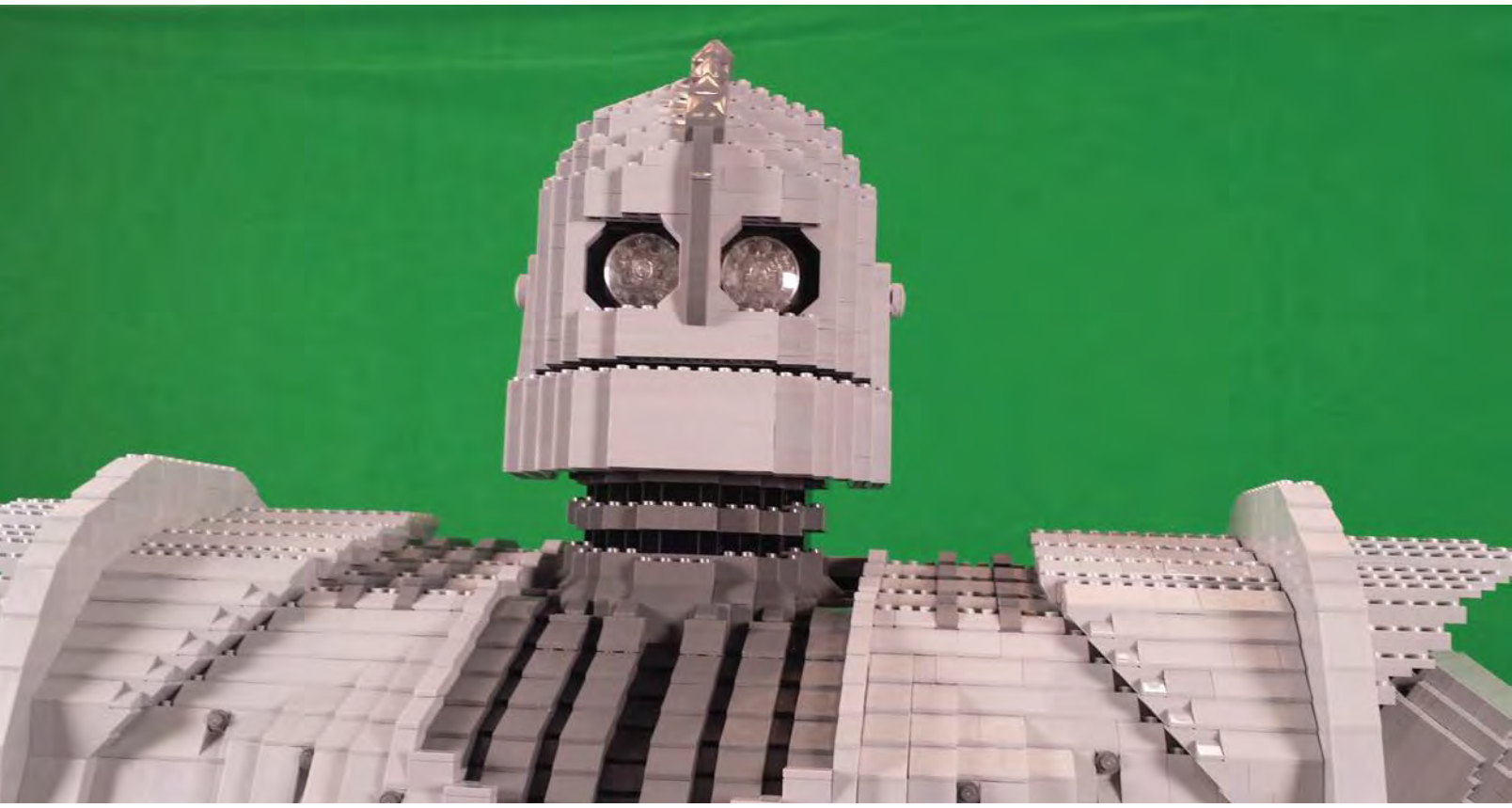
Making the Iron Giant



Article by Joe Meno
Photography by Mike Hallock

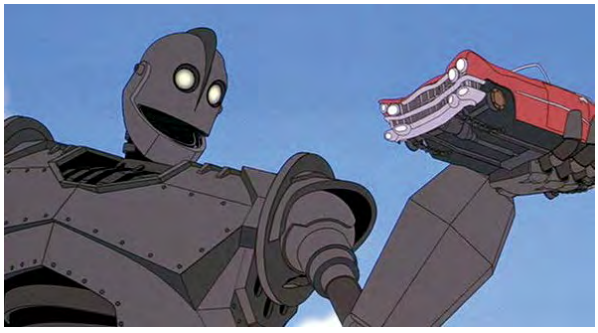
A movie that has had a cult following since its release in 1999 is *The Iron Giant*. Directed by Brad Bird (who later went on to direct *The Incredibles* and *Mission Impossible: Ghost Protocol*), the animated movie is about a boy, Hogarth Hughes, who befriends a large alien robot. The style of the robot is from the '50s, and has become an icon.

Mike Hallock, an application developer at Disney, is a fan of the movie, along with his son. He's also a sculptor that was inspired to build a large-scale model after seeing the Disney-based sculptures at the LEGO Imagination Center at Downtown Disney, Walt Disney World. Because of his background, he wanted to build a model in a larger scale. This would let him build the model with the detail he wanted. It didn't take long for him to decide what to build as his first large-scale building project: an Iron Giant that was motorized. It did take him a long time to build it, though—3 years, to be exact.



Head detail of the Iron Giant.

A look at Hogarth and his car, both in LEGO (above), and from the 1999 film (below).



Before that, he was a LEGO builder for his church group, the Oakland Presbyterian LEGO User Group. There, he built and designed models for summer camps at the church. Currently, he is working on a minifgure-scale amusement park with rides, including a octopus lifted using Star Wars mini vehicles for ride pods. Another project he built was LEGO basketball shooters for a David and Goliath themed program.

But nothing compares to the Iron Giant. Literally. Standing at 5 feet tall, this model is at 1:10 scale, which is double the building scale used at the LEGOLand parks. The robot is motorized to spin at the torso, following a scene where the Giant picks up and spins a 1959 Cadillac Sixty-Two convertible with Hogarth inside.

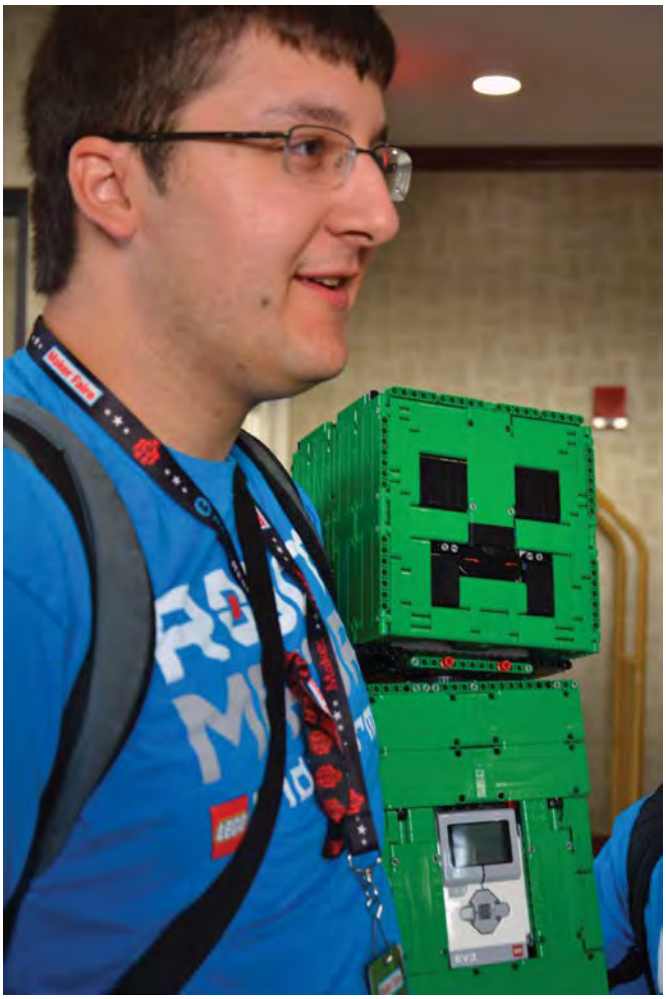
Mike got reference images of the Iron Giant from screen captures of the movie. He also used photos of an Iron Giant toy for more angles he couldn't get from movie footage. For the car, Mike looked up auto photos online of that specific model. From there, it was a process of building prototypes of sections. Once a section was finalized, building a glued version was then done. Gluing was done to keep the robot from breaking apart, especially since it moves.

Growing up with LEGO: My Journey to Becoming a MINDSTORMS AFOL

Article by Andy Milluzzi
Photography by Joe Meno

Everyone has a unique connection to the AFOL (Adult Fan of LEGO) community. AFOLs come from all walks of life, all sorts of backgrounds, but have one thing in common: the desire to create with the iconic LEGO bricks (or beams). I can't say I've ever completely shared my LEGO story, either in print or otherwise. Parts of my story are probably very unique, but I think the underlying passion is something we can all relate to.

It all started with a story, I really don't remember. I was too young, but I have heard it countless times over the years from my mother. As a child I loved to build; LEGO of course was my favorite toy (although I liked, and still do like, model trains). I was maybe 3 years old and my mother came in and saw me building a LEGO set. She said, "Andy you're going to be an engineer someday." To which I replied, "But mom, I don't wanna drive a train."



Andy and his buddy Creep3r after a busy day at World Maker Faire 2014 at the New York Hall of Science, Queens, NY in September 2014.

Crafting a Creep3r

Article by Andy Milluzzi
Photography by Lee Magpili and Joe Meno

Saying, "Minecraft is popular" probably isn't doing it justice. Minecraft is everywhere, from the original PC video game, to Xbox, to clothing, to now LEGO sets. For many, it is an outlet of creativity and a learning tool. It is simply fun. Ask anyone; Minecraft is "digital LEGO bricks".

As an engineer, I often see challenges in relating complex problems and ideas to kids. Minecraft is a way to catch their interest and relate on something they're familiar with. This past year, I encouraged my *FIRST* Robotics Competition team to use Minecraft to learn Boolean logic. This works well for high school students, but how do you engage people of all ages with something complex like robotics?

As a LEGO MINDSTORMS Community Partner, I know the power LEGO MINDSTORMS has to inspire and enable some of the coolest projects. It seemed like a natural fit to use LEGO MINDSTORMS EV3 to being a Creeper to life! And so was born Creep3r.

The idea first came in speaking with LEGO representatives at the 2014 *FIRST* World Championship. Everyone was excited. The challenge became figuring out how to actually construct the bot and defining how the robot would interact with people.

Creep3r really brings out the performance of a single EV3 brick. In defining what Creep3r should do, it quickly became clear that was one hallmark behavior that had to work. So it is sort of a given that a Creep3r needs to walk around and be able to turn his head, but really a Creep3r needs to explode.

What does it mean for a LEGO robot to explode? This question was the hardest challenge of creating Creep3r. I went though several iterations. At first, I thought I could make it explode by launching Zamor Spheres, 1x5 beams, or 2x4 bricks. While cool and exciting to watch, this would mean it would take forever to clean up after each explosion. Having done countless public shows, I knew this wasn't realistic.

The next thought was to engineer Creep3r so it was supported by only a few pins. These pins could be pulled out, causing the robot to collapse. While again cool, this really limited size. I knew I wanted it to be big enough to recognize from a distance. A big robot would have too many supports and would trade strength for this feature. Designing the bot for transport and durability would be nearly impossible.

Finally I settled on the idea of "explosion doors". The idea being that several large doors could be opened and bricks could fall out, or the bot could change color. This solution seemed to balance the needs of strength, size, and explodability (a critical metric for a Creep3r).

Movements were easier to define; with a single motor driving the explosion, the other three motors ports of the EV3 could be assigned. Two motors were required for the ability of the Creep3r to move, leveraging tracks and some green Technic 5x11 panels. One medium EV3 motor could drive the head. Sensors ended up being a bit more complicated.

Unlike most EV3 robots you might build, Creep3r had to hide its sensors. A creeper in the game does not have any arms or really any way of interacting with Steve (the character from Minecraft) except for seeing him, hissing, or exploding. Seeking out Steve is what creepers do and EV3 has the perfect solution to seek and find: the IR sensor. Like a set of eyes, the sensor can tell where an object is relative to the sensor. Hiding the sensor was a bit more difficult as the eyes for the model would be larger and set apart, so I had to be clever.

The head of a creeper is iconic and making sure it looks correct

Lee Magpili: A LEGO Educator

Article by Joe Meno

Photography provided by Lee Magpili and the LEGO Group

The LEGO® MINDSTORMS® set is different things to different people. To the majority of LEGO builders and the public, it's a complex and somewhat intimidating set that combines building models with computer programming. To a few unique builders, the set is a gateway to building models that go beyond the usual static model to one that can move and even react to different things.

The LEGO® Group has focused the MINDSTORMS sets for use in schools as a way to teach science and technology. LEGO Education is a branch of the company that creates and provides resources for classrooms, including dedicated MINDSTORMS sets and curriculum. Lee Magpili is a MINDSTORMS model designer for LEGO Education. Since 2010, he has been creating models of creatures and more recently, scientific devices.

Lee with the models he built for LEGO Education.

"If you want to be a designer, don't forget to keep
I know I am not the best builder

L3-G0 on the go!

L3-GO:
the LEGO R2 Unit

Article by Shawn Steele
Photography by Joe Meno and Shawn Steele

Many MOCs are great models: wonderful art, amazing Technic builds, ingenious MINDSTORMS constructs and the like. People admire them, ask questions, and are fascinated by details, but most sit on a table to be admired. When the MOC is a character, then the interaction changes. L3-G0 is no longer just a LEGO model, but to the kids he's actually R2-D2. They can talk to him and he'll beep back. Tease him and he'll follow them around. Exhibiting L3-G0 is unlike any other MOC we've built. Way more effort, but rewarding.

Like most of our builds, deciding to build L3-G0 was happenstance. Wondering what we might build next, we saw the R2-D2 Builder's Club droids at a convention and thought their builds were pretty cool. We even toyed with the idea of making our own "real" droid. But that seemed "hard" and "expensive," so we let it lie until one day we realized (duh) that we could make him in LEGO. Joining the R2-D2 Builder's Club was the easy part.

Planning

L3-G0 required a ton of planning. LEGOLand has static R2-D2 models, but they use a big stack of studs-up bricks. We wanted our Artoo to be able to move and talk, spin his dome and more. With those goals in mind, a hundred-pound mass of bricks didn't seem very practical. Another goal was to be screen-accurate. The R2-D2 club plans are based on tons of research by dozens of club members and were a great help. (JJ Abrams hired a couple members of that same club to build droids for the new *Star Wars* movie, so those were definitely the plans we were looking for!)

Once we had the germ of the idea, it took a bit to get serious. While the family was out of town, I started a study in LEGO Digital Designer (LDD), primarily to see if the project was at all feasible. I began with a foot and its challenging angles. Another challenge was the Holoprojector on the dome with its detail. I forgot I was just planning a few tests and kept going with the LDD models.

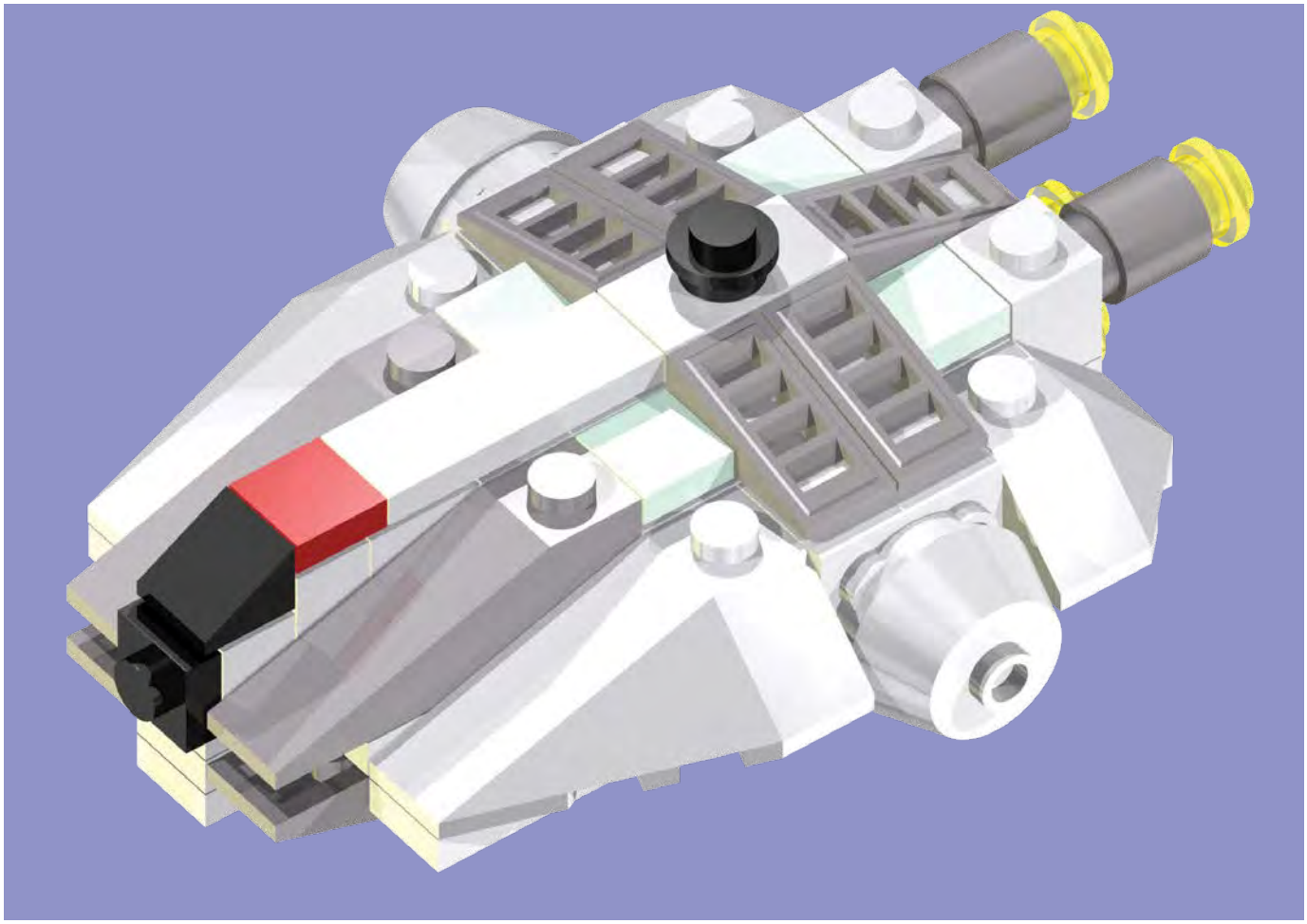
The club drawings are designed for CAD/CAM systems, not LEGO, so I needed LEGO-compatible plans. Dimensions were converted from inches to studs and plates, and I drew grids to LEGO brick scale over many of the blueprints. The grid enabled correct positioning of the details. The result is a very precise model, with most details being screen accurate to a fraction of an inch.

When Lara returned a couple weeks later, the plans were mostly complete and we decided to go ahead. It took another week just to organize and order the bricks, with the same challenges of any other MOC. Some bricks we used in LDD are rare or the wrong color, so substitutes had to be selected. Tricky bits needed extra brick for alternate approaches. The model lacked some structure; we ordered extras to cover that as well. The initial LDD drawing was 14,529 bricks. The final model is closer to 16,000 parts.

Pure LEGO

Individual sections were built first out of "pure" LEGO, modified as needed, and added to the complete model. Most components deviated significantly from the original LDD model in the end.

For his first BrickCon appearance, L3-G0 was complete and built from the bottom of the body to the tip of his head. His



Star Wars Rebels: MINI Ghost

Design and Instructions by Christopher Deck

With the new *Star Wars Rebels* series, we are looking forward to new and exciting *Star Wars* technology, being revealed during the process of the series. In this issue we want to take a look at the main characters' primary starship, the *Ghost*, a modified Corellian VCX-100 light freighter. An official set by the LEGO® group (set no. 75053) has already been released, as well as some miniatures in the style of the recent "Microfighter" series (sets 75028-33). I am glad to build a mini model of the *Ghost* together with you this issue.

The freighter resembles a quite compact design with many slopes and angles. While the ship looks like an ordinary transport and a common mini model, it has two separate stud inversion sections. This way we can add slopes from both sides of the hull in a perfectly symmetrical manner. About 20% of all pieces used are slopes and wedges, which is quite a lot and makes the "Ghost" more than just a box with engines. Let's hope to see more interesting vehicles from the brand new *Star Wars Rebels* series. I wish you happy building and I'll see you next time!

You can view Christopher's webpage by going to www.deckdesigns.de or scanning this QR code!

Parts List

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

Inner Spine

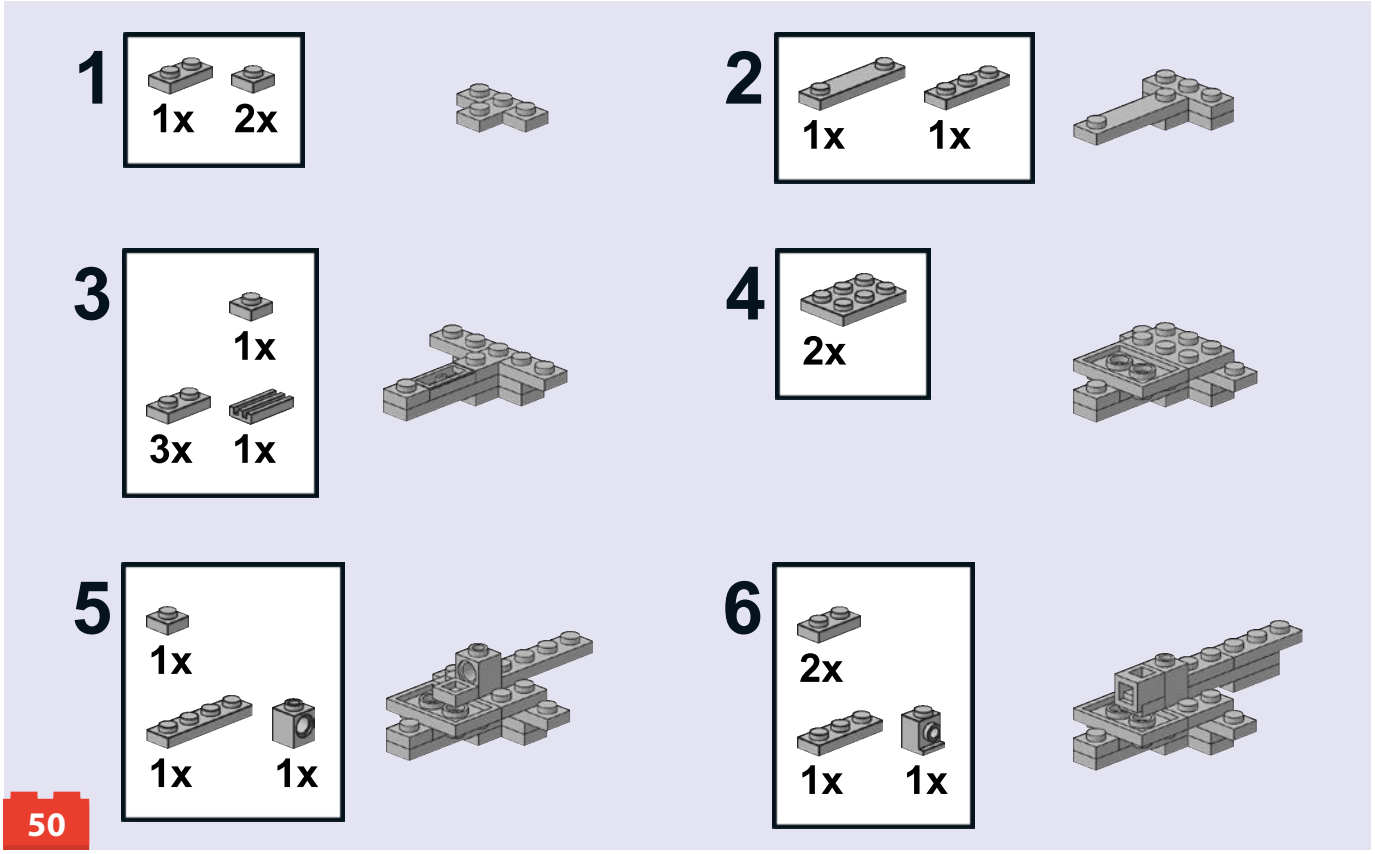
Qty	Color	Part	Description
3	Light-Bluish-Gray	4070.dat	Brick 1 x 1 with Headlight
1	Trans-Black	3024.dat	Plate 1 x 1
4	Light-Bluish-Gray	3024.dat	Plate 1 x 1
1	Trans-Black	4073.dat	Plate 1 x 1 Round
6	Light-Bluish-Gray	3023.dat	Plate 1 x 2
1	Light-Bluish-Gray	3794a.dat	Plate 1 x 2 without Groove with 1 Centre Stud
5	Light-Bluish-Gray	3623.dat	Plate 1 x 3
1	Light-Bluish-Gray	3710.dat	Plate 1 x 4
1	Light-Bluish-Gray	92593.dat	Plate 1 x 4 with Two Studs
2	Light-Bluish-Gray	3021.dat	Plate 2 x 3
1	Light-Bluish-Gray	43710.dat	Slope Brick 2 x 4 Triple Left
1	Light-Bluish-Gray	43711.dat	Slope Brick 2 x 4 Triple Right
1	Light-Bluish-Gray	61409.dat	Slope Brick 18 2 x 1 x2/3 Grille
4	Light-Bluish-Gray	60477.dat	Slope Brick 18 4 x 1
1	Trans-Black	54200.dat	Slope Brick 31 1 x 1 x 0.667
1	Light-Bluish-Gray	6541.dat	Technic Brick 1 x 1 with Hole
1	Dark-Red	3070b.dat	Tile 1 x 1 with Groove
1	Light-Bluish-Gray	2412b.dat	Tile 1 x 2 Grille with Groove
1	Light-Bluish-Gray	63864.dat	Tile 1 x 3 with Groove

Outer Shell

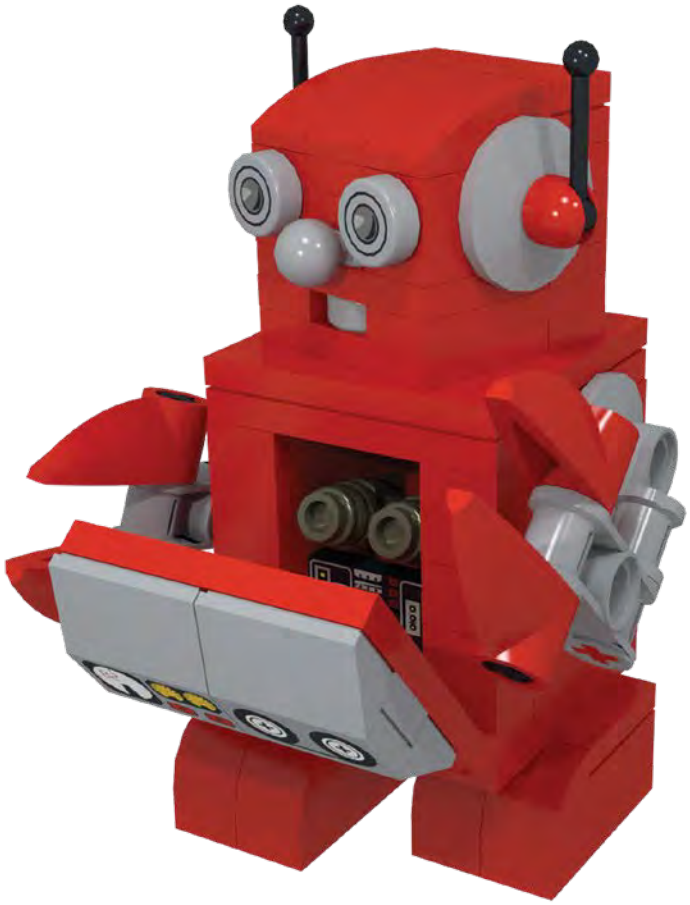
Qty	Color	Part	Description
2	Light-Bluish-Gray	44728.dat	Bracket 1 x 2—2 x 2
2	Dark-Bluish-Gray	3062b.dat	Brick 1 x 1 Round with Hollow Stud
2	Light-Bluish-Gray	87087.dat	Brick 1 x 1 with Stud on 1 Side
2	Light-Bluish-Gray	98100.dat	Brick 2 x 2 Round Sloped
2	Trans-Yellow	4073.dat	Plate 1 x 1 Round
2	Light-Bluish-Gray	3023.dat	Plate 1 x 2
2	Light-Bluish-Gray	3710.dat	Plate 1 x 4
2	Light-Bluish-Gray	3022.dat	Plate 2 x 2
4	Light-Bluish-Gray	2420.dat	Plate 2 x 2 Corner
4	Dark-Bluish-Gray	61409.dat	Slope Brick 18 2 x 1 x2/3 Grille
2	Light-Bluish-Gray	13548.dat	Slope Brick 45 2 x 2 Double Convex with Cant
4	Sand-Green	3070b.dat	Tile 1 x 1 with Groove

Bottom

Qty	Color	Part	Description
4	Light-Bluish-Gray	4070.dat	Brick 1 x 1 with Headlight
1	Light-Bluish-Gray	87087.dat	Brick 1 x 1 with Stud on 1 Side
1	Light-Bluish-Gray	3024.dat	Plate 1 x 1
2	Trans-Yellow	4073.dat	Plate 1 x 1 Round
2	Dark-Bluish-Gray	4073.dat	Plate 1 x 1 Round
1	Light-Bluish-Gray	3623.dat	Plate 1 x 3
2	Light-Bluish-Gray	3022.dat	Plate 2 x 2
2	Light-Bluish-Gray	2420.dat	Plate 2 x 2 Corner
4	Dark-Bluish-Gray	61409.dat	Slope Brick 18 2 x 1 x2/3 Grille



BrickNerd DO IT YOURSELF FAN ART!



Tin Robot

Design and Instructions by Tommy Williamson

About this issue's model:

Since ancient times, humans have been captivated with the ideas of robots. Why we are so preoccupied with these labor-saving machines is a mystery, but just about everybody finds them fascinating. When I heard the theme of this issue was robots, I briefly considered all manner of MOCs inspired by pop culture. There's my favorite robot, R2-D2, there's the classics like Robby and the robot from *Lost in Space*, but then I thought about my childhood, before *Star Wars* came out, before I was watching re-runs of sci-fi classics—back when "robot" meant one of these guys, wound up and lumbering across the floor. So I give you a classic wind-up robot toy; 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
2	3005.dat	Red	Brick 1 x 1
2	4070.dat	Red	Brick 1 x 1 with Headlight
6	87087.dat	Red	Brick 1 x 1 with Stud on 1 Side
3	3004.dat	Red	Brick 1 x 2
1	3622.dat	Red	Brick 1 x 3
2	3010.dat	Red	Brick 1 x 4
4	6091.dat	Red	Brick 2 x 1 x 1 & 1/3 with Curved Top
1	4213.dat	Red	Hinge Car Roof 4 x 4
2	4592.dat	Red	Hinge Control Stick Base
1	4315.dat	Red	Hinge Plate 1 x 4 with Car Roof Holder
4	3024.dat	Red	Plate 1 x 1
5	3023.dat	Red	Plate 1 x 2
2	3623.dat	Red	Plate 1 x 3
3	3710.dat	Red	Plate 1 x 4
5	3022.dat	Red	Plate 2 x 2
2	2420.dat	Red	Plate 2 x 2 Corner
3	87580.dat	Red	Plate 2 x 2 with Groove with 1 Center Stud
4	3021.dat	Red	Plate 2 x 3
1	3020.dat	Red	Plate 2 x 4
2	3031.dat	Red	Plate 4 x 4
3	11477.dat	Red	Slope Brick Curved 2 x 1
1	32062.dat	Red	Technic Axle 2 Notched
1	3700.dat	Red	Technic Brick 1 x 2 with Hole
4	41669.dat	Red	Technic Tooth 1 x 3 with Axlehole
3	3069b.dat	Red	Tile 1 x 2 with Groove
1	63864.dat	Red	Tile 1 x 3 with Groove
2	2431.dat	Red	Tile 1 x 4 with Groove
2	87993.dat	Metallic Dark Gray	Minifig Gun Laser Pistol
1	98375.dat	Metallic Dark Gray	Minifig Toy Winder Key
2	4593.dat	Black	Hinge Control Stick
2	4519.dat	Black	Technic Axle 3
1	3069bps6.dat	Black	Tile 1 x 2 with SW Jedi Starfighter Controls Pattern
4	4740.dat	Light Bluish Gray	Dish 2 x 2 Inverted
1	3614.dat	Light Bluish Gray	Plate 1 x 1 Round with Towball
1	3710.dat	Light Bluish Gray	Plate 1 x 4

Building a Robot:

Article by Joe Meno

Sometimes, inspiration hits you from the most unusual of places. In this particular case, it was an event: Free Comic Book Day, a Saturday in early May that was established by publishers to promote comics and graphic novels. Over the past few years, what started as a way to get the word out on comics became events at comic stores, with entertainment and artist signings and displays. My club was asked to come and show our models, so I and another member set up some creations.

Since I had a few months notice, I took a look at who was going to be at the event, and found that a comic by the name of *Atomic Robo* was going to be represented. At the time, the comic was unfamiliar to me, but a picture of the title character caught my eye. Atomic Robo, as you may have guessed, is a robot. He's Nikola Tesla's last creation, and is a core member of Tesladyne, a group of Action Scientists who respond to paranormal and supernatural emergencies. He also looks really cool, which gave me reason enough to build him.

Starting Out

The first thing to do when building a model is to find as much reference as possible. For Atomic Robo, it was pretty easy to look him up online for initial reference and then buy a few books to complete my research. Atomic Robo's first book gave me more than enough reference to work with, thanks to a section that talked about the robot's design.

When I build a model that is held to a level of accuracy, I start at the most complex area and work out. In Atomic Robo's case, the part that had to prove to any viewer that he was unique was his head. While Robo's head is rather featureless, it still had a look, and I needed to capture it with LEGO elements.

Minifig Customization 101:

This is not the FLO You're Looking for!

by Jared K. Burks

You wanted Flo?

Through the course of this series we have covered how to customize or modify many different kinds of minifigures. These techniques can be applied to most any LEGO part. In this article we are going to use just a couple of droid minifigure parts and some non-droid parts to create something new. I challenge you to look outside the classical minifigure parts when creating custom figures. Get creative; don't limit yourself to only LEGO parts — look everywhere for inspiration.

So let's create a FLO minifigure — no, not *that* Flo (left). Let's look at FLO, also known as WA-7 from *Star Wars*. FLO is a unicycled service droid in Dex's Diner on Coruscant. According to the *Star Wars* wiki, FLO had a built-in transmitter, keeping her in contact with the kitchen and a paired set of repulsor stabilizers that allowed her to maintain balance as she moved around her customers. Apparently FLO disliked low tippers and was often seen flirting with the dishwasher unit.

FLO was featured in several scenes of *Star Wars: Episode II Attack of the Clones* when Obi-wan drops in to visit Dex. She also made an appearance in the *LEGO Star Wars* Video Game, where Dex's Diner featured as the hub for the game. It is the video game version of FLO that I will use as inspiration for the figure. As in most of the games, the designers take license to create figures using parts that either do not exist or combine elements to create new ones. Well, we can do that too.

MINDSTORMS 101: The Perils of Dead-Reckoning!

Article and art by Damien Kee

In the last installment of our MINDSTORMS articles we used a gripper attachment to pick up objects. This time, we look at one of the challenges in robotics competitions: how to move your robot accurately.

It is common for many teams when competing in Robotics competitions to rely heavily on dead-reckoning. But sometimes, this is not the best option.

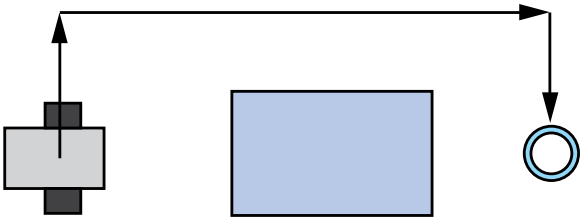
What is Dead-Reckoning?

Dead-reckoning is the process of driving your robot around without the aid of external sensors. The theory goes, if you know where you start, and you know exactly how far you are telling your motors to travel, then you can calculate *exactly* where you'll end up after a move.

Well that sounds great in theory. Suppose I've got the following challenge. Navigate the robot around the obstacle and stop at the ring.

Providing I line up my robot perfectly straight, this could be a possible solution:

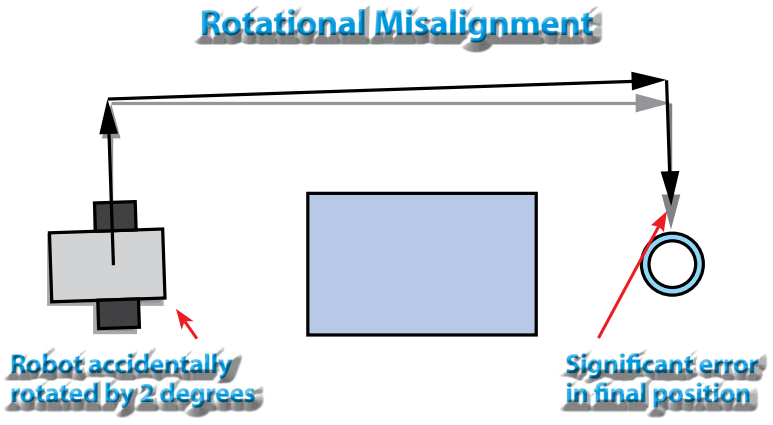
1. Turn 90 degrees left
2. Drive Forward
3. Turn 90 degrees right
4. Drive forward
5. Turn 90 degrees right
6. Drive forward



In the robot's mind, what it is effectively doing is closing its eyes, driving blindly while following its instructions, then at the end it opens it eyes and hopes that it is in the right place. In reality there are often things that can go wrong.

Misalignment

Looking back at the above example, let's suppose that in the rush of the competition countdown clock, I don't line up my robot as well as I wanted. When placing, I put it down 2 degrees counter-clockwise from what I had intended. Two degrees isn't very much at all, and to the human eye is probably not even noticeable, but because the robot doesn't realize this misalignment, it will just continue on its predetermined path. However, it can lead to significant errors in where the robot will finish. This is called Rotational Misalignment.



LEGO IDEAS 101: Finding Your Audience

Article by Glen Wadleigh

LEGO Ideas (https://ideas.lego.com/) is a website that lets you submit your own set designs to LEGO, and if they garner enough public support (10,000 votes), LEGO will review and consider producing them. But there are two huge misconceptions about promoting LEGO Ideas projects. The first misconception is that you don't need to promote your Ideas project. Putting your project in front of potential supporters is essential to getting a LEGO review.

For those that realize that promotion is required, most unfortunately make the mistake of promoting their project only in the LEGO fan community (FOLs).

You certainly should not ignore FOLs, but excepting a few extreme cases, the average FOL is not going to be your strongest supporter. Why? Well, FOLs love LEGO, and what they can do with it. But, we each have favorite themes and subjects and, regardless of how much one loves LEGO, we are not going to support a project just because it is LEGO.

Additionally, even if you find FOLs who like your project's subject, we are highly inoculated to whatever you have to show us. We eat, sleep, and breathe LEGO. Many will reject your project because they A) Have seen it done better, B) Can do it themselves, or C) "Know" LEGO won't make it for any number of perceived or actual reasons, and the list goes on...

On top of all that, many FOLs are surprised to find out how small the active FOL community is. In North America, for example, there are only 3500 LUG members. Even the most popular articles on Brickset.com rarely get more than 10,000 views.

So, in promoting your project to FOLs, you are targeting a relatively small community, and only a subset of a subset of this community is likely to support your content.

Where do you go for support then?

It is quite simple. Although not everyone is a FOL, nearly everyone likes LEGO. So find the people who love the subject of the project and they will like your LEGO version of it, hopefully enough to support it.

Consider the communities that might be interested in your project, then figure out the best way to contact them. Google is incredibly helpful for this.

For instance, if you were to seek out supporters for the Classic Douglas DC-3 (https://ideas.lego.com/projects/17534) you might try to present your project to:

- Fans of the Douglas DC-3 (pretty obvious)
- Fans of the C-47 Skytrain, Dakota, Lisunov Li-2, and Lisunov Li-2 , and the other variations of the DC-3
- "AvGeek" or "Aviation Geek" sites (I am led to believe that is the equivalent of FOL in the aviation fan community)
- Boeing Aircraft (Boeing owns Douglas)
- Pilots
- Airplane photo "clubs"
- Airplane museums
- Airshows
- Airplane podcasts
- Airlines (especially those that use the DC-3)
- Social media personalities who like airplanes or are, in fact, pilots
- World War II buffs
- Pulp Adventure fans (Including Indiana Jones)
- Aircraft Model enthusiasts

You will want to investigate every avenue, but you tend to get a bigger bang for your buck if you focus on the groups with a wide reach and a heavy focus on your specific subject.

You will need to be creative, persistent, and thorough. You will get many rejections along the way, but you will also find people who are absolutely stunned by the fact that you have taken something that they are passionate about and materialized it in LEGO.

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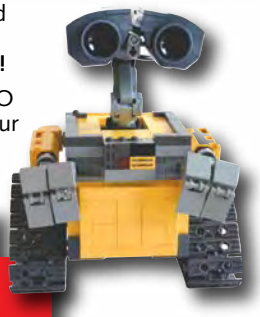

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Robotsim running an NXT robot on a FIRST® *LEGO® League game field.*

Cogmation: Simulating LEGO Robots

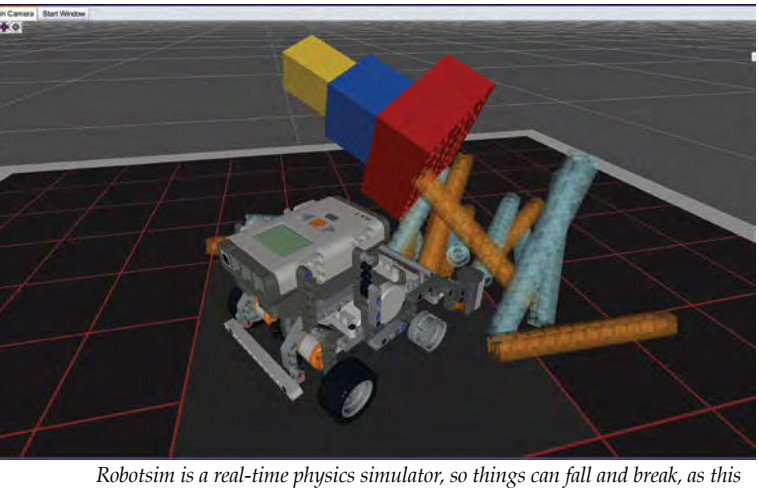
Article by Joe Meno
Screengrabs provided by Cogmation

One of the challenges of starti
or program is the robot itself,
MINDSTORMS sets are at a p
challenge to raise. What if the
robot that was less expensive
company Cogmation may ha
Robotsim.

Cogmation is a company that
University of Manitoba stude
From there, they branched int
working on industrial robotic
got involved with FIRST thro
thinking about simulators for
LEGO MINDSTORMS simul
simulator, named Robotsim, v
MINDSTORMS robots not on

Users of the simulator will be
in all phases of constructing t
can be done using LEGO Dig
that is available for both Macintosh and Windows systems.
This program has been around for a few years and is used by
LEGO fans to build models and robots. Robots created from
LEGO Digital Designer are then imported into Robotsim and
can be programmed using MINDSTORMS software.

When the robot is imported into Robotsim, it is placed into
a simulation environment that can be made into any place
desired. Robots start in a generic room, but can be placed
on a FIRST LEGO League game table (with models), or a
custom sumo platform, or even on a lunar environment with
accurate gravity! Once programmed, the robots perform in the
environment as they would in real life, with accurate physics.
Challenges can be created and evaluated in the program as
users build and learn to solve them.



Robotsim is a real-time physics simulator, so things can fall and break, as this screen shows.