

# Stuylights

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At the kickoff for this year's game, Dean Kamen announced his 2009 homework assignment: find team alumni and reconnect them with FIRST. In an effort to organize not only Stuypulse alumni but also FRC, FTC, and FLL teams from all over, we launched FIRSTConnects.US, a networking site for all people affiliated with FIRST. Now in beta testing, we have almost 250 members from 3 countries. The site currently allows users to search our database of teams, current members, and alumni and make a personalized profile. Our goals are to allow people in FIRST to stay in contact with one another, to enable new teams to quickly find mentors and materials, and to create an online marketplace for internships.

The job of Stuypulse videographers is to document the magic of robotics so other people can experience the same wonders we do every day. Two impressive projects this year were videos for the President's Circle and the Chairman's Award. The President's Circle video is meant to encourage students to start their own teams; our video, published on FIRST's YouTube Channel, gave viewers a glimpse of the team's everyday experiences. Our Chairman's Award video documented Stuypulse's community service, including mentoring nascent FIRST teams, running Lego League practice competitions, and holding an ongoing canned-food drive.

## Videography

By Jessina Wong

Creating these videos involved a mix of interviewing students, filming behind-the-scenes action, and artistically putting it all together in a way that sets us apart from other FIRST teams.



A segment of our President's Circle video.

Please visit us online and see our work for yourself!

[www.FIRSTConnects.us](http://www.FIRSTConnects.us)

For StuyPulse videos and animation:

[www.Vimeo.com](http://www.Vimeo.com), search Stuyvesant Robotics

## A Year in Animation by Elliot Cohen

This past year was the debut of our animation team. It was a difficult year for us as rookies, but with the help of mentor Robert Lin, animators learned to utilize the many abilities of 3ds Max, the powerful 3D graphics program used for the FIRST Animation competitions. We were fast and thorough enough to finish our animation in time for the FIRST Visualization Competition, and though we did not win, our animation was one of the most original and engaging entries. Another key goal of our animation team this year was to get more teams interested in animation. There were few animation teams at the New York Regional this year, an issue we faced by running an animation class in a conference room during the Regional. It was well-attended, and we will continue to give classes in an attempt to spark more interest in animation in FIRST.

# FIRST Tech Challenge

By Stephen Profeta and Yimeng Xu



## FTC Expansion

By Robert Juchnicki

Our Stuyfission and Stuyfusion teams experienced numerous changes and expansion this season. The first of these changes was the introduction of a new platform: the TETRIX kit from Pitsco. One of the most striking differences between the new and old systems is the incorporation of LEGO robotics parts. Teams were also given a choice of using LEGO programming software, LABView, or RobotC. Our teams opted for RobotC, a language that we are more familiar with. The use of LEGO pieces and programming language is part of an effort by FIRST to create a bridge between its FLL, FTC, and FRC programs.

Aside from the hardware and software switch, Stuyfission and Stuyfusion sought to expand by seeking a closer relationship with Stuyvesant Robotics' FRC team. The first step toward this was encouraging our members to participate in both teams. Stuyfission and Stuyfusion taught new FRC members how to use old VEX kits for a mini-competition. After seeing what both build seasons entailed, several students on the FRC team decided to join FTC, too. Following an eventful year, Stuyvesant FTC hopes that, by pushing the boundaries and working together with FRC, we can bring Stuyvesant Robotics to new heights.

Stuyvesant H.S's two FTC robotics teams had a ground-breaking year. For the 2009 FTC challenge, **Stuyfission** and **Stuyfusion** needed to place hockey pucks initially situated on racks onto a three-tiered goal. In tackling this, the teams learned about physics, organization, teamwork, and building a successful robot.

**Stuyfusion** considered a variety of designs, ranging from an intricate praying mantis-bot to a trebuchet-bot. After several prototypes, the final design was based on a firetruck. Unlike other robots at the competition, **Stuyfusion's** bot could prevent opponents from scoring by sending a smaller robot (the fireman) to the top of the goal. After gathering pucks and scoring them during the autonomous period, the bot could either stay on the goal and block opposing robots from scoring, or climb down and gather more pucks. **Stuyfission** carefully prototyped several lift-based designs, including a catapult and an elevator, before settling on a tow-truck with a long arm. Their strategy was simple: get pucks and drop them from above onto the top goal.

Even after settling on a final design, both teams faced obstacles. Limited time and an unfamiliar kit of parts prevented **Stuyfission** and **Stuyfusion** from following their original designs. Long meetings right before competition gave **Stuyfission** enough time to test-drive their robot as **Stuyfusion** made final adjustments to their code. However, both teams faced major issues early on in the competition. **Stuyfusion** discovered an error that restricted mobility so severely that the robot had to be immediately redesigned to focus exclusively on scoring. Within a matter of hours, the team produced a robot that was competition-ready. Meanwhile, **Stuyfission** battled software issues. After working diligently at re-writing and troubleshooting, they were rewarded by easily winning their later preliminary rounds. **Stuyfission** went on to become an alliance captain, putting up a brave fight against the top alliance before being eliminated in the quarterfinals.

Neither team returned to Stuyvesant empty-handed, as they left with the knowledge required to lead a successful team in the future. **Stuyfission** and **Stuyfusion** plan on proceeding to the national championship next year.



# Michael 1: Deconstructed!

By Seth Berg

It's not easy to build a competitive robot in six short weeks, but Michael 1 proved himself as one of the toughest on the field, ultimately becoming the sixth-highest scorer in the nation. Here's how he ticks:

## SHOOTER

Michael 1's shooter is a lethal combination of speed and accuracy, consisting of a wide mouth and adjustable ramp. 30 Orbit Balls can be shot out in under seven seconds.

## HOPPER

Michael 1 started off matches by autonomously driving to a human player, who filled the hopper with balls. Made out of a thin, flexible plastic known as Lexan, the hopper could accommodate up to 25 balls, and did not have to be repaired once.

## EMPTY CELL HOLDER

To grab an extra 15 points, the "Ricci Apparatus" safely transported Empty Cells that could be exchanged for high-value super cells.

## CONVEYOR

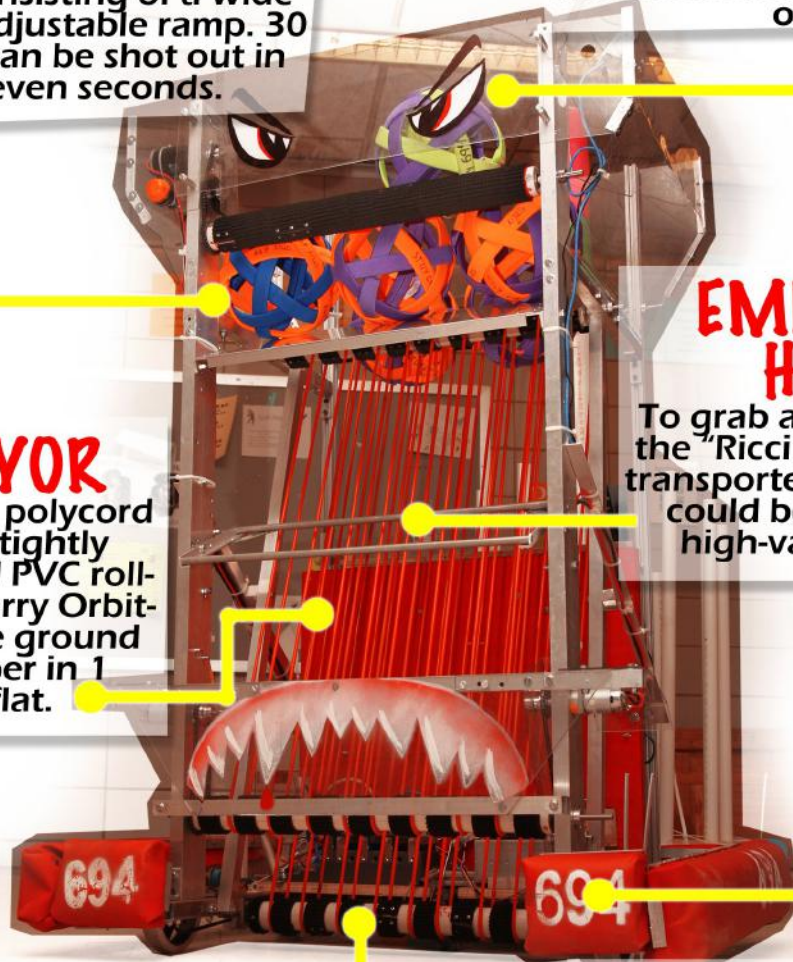
Bright orange polycord loops were tightly strung around PVC rollers that can carry Orbit-Balls from the ground to the hopper in 1 second flat.

## ACQUIRER

By studying successful designs from 2002 and 2006 we found that the most effective way of picking the balls off the ground is to use a fast-spinning roller. The roller tread was selected for its low cost, high friction, and resistance to wear, and was powered by a high-speed motor.

## DRIVETRAIN

Michael 1 overcame low friction between the slick wheels and the field with a simple drivetrain that powered all four wheels, which gave better handling. The back wheels were directly driven from the output shafts, and the front wheels were chained to the back ones using lightweight chain. Together with the drive code, Michael 1 could maneuver quickly without "slipping out."





Stuypulse embarked on its ninth year with over 100 team members, every single one needed to tackle this year's unique challenge. Faced with a slippery new floor surface known as regolith, moving targets, and 120 game pieces, we not only completed Michael 1 in record time but we also created our most sophisticated and powerful robot to date.

One of our first concerns this year was figuring out if the robot could actually drive on Regolith. The miniscule coefficient of friction between the smooth wheels and smooth field surface meant that starting and stopping would be very difficult, but the team decided early on that a four-wheeled, two motor drivetrain would provide the best ratio of functionality to weight. We then turned our attention to picking up orbit balls and shooting them into opponents' trailers. By the end of the first week, we had chosen our best designs and began prototyping everything from dumpers and shooters to conveyor belts with hooks.

As the engineers spent week two building with cardboard, wood, and metal, the programmers tackled a completely new control system. Rather than waiting for a finished robot, we went straight to work by putting new electronics on a spare robot and programming basic drive code, camera code, and traction control. Fortunately, the team decided on a specific design early on and had the entire robot modeled in Autodesk Inventor by the start of Week 3.

Though the third week conflicted with final exams at Stuyvesant, dedicated team members came to longer, daily meetings and were hard at work milling towers, making conveyor belts out of stretchy orange polycord, and mounting motors to the drivetrain. Construction was speedy since our model gave us accurate dimensions for every part.

Just four weeks into build season, Stuypulse had the entirety of Michael 1 constructed. Though we had never built a robot with an entire two weeks to spare, we took the time to create a new list of improvements to make. New sensors were wired to accurately gauge robot speed and direction, the frame and chassis were reinforced, autonomous routines were tested, and a spare ramp from our '07 robot, Tom, was turned into a robot cart. After a full five weeks of testing, new electronics were moved onto Michael 1 and formal driving practice on our model field began.

With the robot completely finished, the home stretch of the build season was spent on final touches that made our robot stand apart. A pair of glaring eyes was painted on the front of our clear Lexan hopper, the chassis was strengthened with a Lexan plate with teeth on it, and a seven autonomous routines were programmed for competition. We also decided to make a separate ball dumper for collecting empty cells; this last-minute addition made us capable of scoring an additional 15 points at the end of every match.

An exhausting six weeks after the January 3<sup>rd</sup> kickoff, we sent Michael 1 to the Jacob Javits Center for our first regional event of the season, knowing that we would have to work even harder in 2010 to surpass all that we had accomplished this year.



## How to Play "Lunacy"

In the 2009 FRC challenge, two alliances of three (randomly selected) teams squared off on a slippery plastic field. Robots could only be driven on slick wheels that made turning difficult, and were attached to a "trailer" at the beginning of each match. The object of the game was to acquire Orbit Balls and deposit them into an opponent's trailer. Matches were two and a half minutes long, and divided into three periods: autonomous, teleoperated, and end-game.



Moon Rock– 2pts



Empty Cell– 2pts, can be exchanged for Super Cells



Super Cell– 15pts during the end-game



## Mentoring

By Mao Hu

Stuyvesant Robotics takes great steps towards helping other FRC and FLL teams in our area. Part of our mission is to help new teams with advice, materials, and other support to help them get on their feet. We mentored rookie teams Francis Lewis H.S. (3017) and Martin Van Buren H.S. (3053), teaching them throughout the summer and build season about logistics, fundraising, programming, and engineering. More significantly, we don't stop helping new teams we bring under our wing after just one year, as evidenced by our continuing mentorship of the Warhawks (2554) from J.P. Stevens H.S. and Steel Hawks Robotics (2601) from Townsend Harris H.S, both founded in 2008. As one of the leading FRC teams in NYC, Stuyvesant Robotics also seeks to help FRC's younger sibling, the FIRST Lego League. We regularly mentor FLL teams I.S. 89 and P.S. 51 Abundant Waters, the latter of which we founded in early 2008. Through mentoring and refereeing, we hope to impart some of our love for robotics to a younger generation.



Stuyvesant's cafeteria during the 2008 Interest Meeting.

This season we boasted our largest recruitment yet. Over 200 students watched live robot demonstrations as they learned about marketing, programming, and engineering. The school walls were plastered with flyers during the week leading up to the event, and robot displays were held on heavily trafficked floors. More than 100 of the interested students attended the first lab meeting later that month. After passing the annual safety exam alongside returning members, they became newbies and official members of the team. Challenging projects were assigned to new members to acquaint them with the different departments. Mentored by older members, engineering newbies were put into groups tasked with designing small edu-bots that played robot-soccer with ping-pong balls. New marketers designed together last season's magazine, working side by side with senior marketing members. They also helped look for new sponsors and built relationships with current sponsors. Programmers were taught the basics of C and explored alternative programming languages such as LabView. Just three months after joining the team, the newbies were ready for a long and busy build season.

## First Lego League

By Robert Juchnicki

An important part of our team's outreach efforts is providing volunteers for the middle school level FIRST LEGO League. FLL teams build autonomous LEGO Mindstorms robots that compete head to head. For this year's challenge, we sent volunteers to almost all the FLL tournaments throughout the city, playing a crucial role at each one.



Students prepare for the start of a new match.

We hosted the Manhattan Borough practice tournament near the end of the FLL build season. Held in Stuyvesant's own cafeteria, the annual scrimmage was hosted, set up, and staffed entirely by team members. The event was a huge success and provided good match practice for the teams and refereeing practice for our volunteers.

Between late December and mid-January, our team sent volunteers to 4 out of 5 borough qualifying events, and all of the referees for the Manhattan qualifier. We were refereeing in force at the Citywide Championship, where 72 teams competed to advance to the International competition in Atlanta. Although our team was simultaneously competing in the New York FRC regional, we still sent ten referees for the FLL competition, including a head referee.

Our latest volunteering effort was at the DYCD tournament in June, which hosted forty teams from various after-school programs around New York City. Stuypulse is very excited to take part in next year's FLL competitions, and we will continue supporting the development of young engineers.

## Stuypulse Recruitment

By Spencer Birnbaum

To tackle the sheer “Lunacy” of the 2009 FIRST challenge, Stuypulse built Michael 1, an offensive robot designed to vacuum up the orbit balls and dump them into our opponents' trailers at an alarming speed. The six weeks of build season flew by quickly, but they were followed by three exciting competitions that helped make 694 a number recognized nationwide.

We proved how monstrous Michael 1 was at our home regional at the Jacob Javits Center in March. After winning 5 out of 7 qualifiers, we led the 5th alliance with Teams 3111 and 395 to the semifinals, scoring a record 124 points in the quarterfinals. Along with our successes in the competition, our team ran a canned food drive, held robotics classes, and promoted FirstConnects.us with our own informational booth.

Later that month, we participated at the competitive Hartford Regional for the first time in three years. We did extraordinarily well, coming in third in the preliminaries. With Teams 121 and 173, we made it to the semifinals in spite of serious field errors. Our impressive performance on and off the field earned us the Entrepreneurship Award, a prestigious honor given to the team that has shown a truly professional approach in spreading the FIRST message.

Following the official FIRST regionals, we joined forty-two teams at Monty Madness, our first off-season event where Team 694 ultimately made it to the quarterfinals. Though we did not take home first place, we can proudly enter our tenth year knowing that we are more competitive than ever.



Drivers Seth Berg, Joseph Blay, and Joe Ricci at the Hartford Regional.

## Stuypulse in the News

By Erica Chan

*"To transform our culture by creating a world where science and technology are celebrated." This idea is at the heart of*

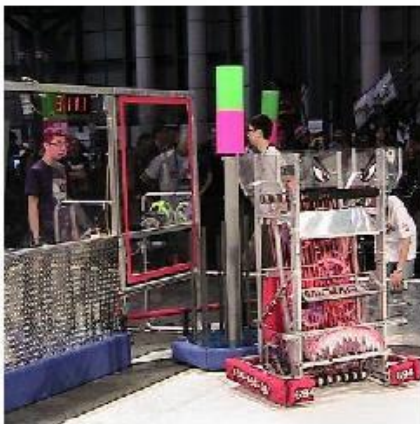
*Stuyvesant Robotics' mission.* For almost a decade, we've spread the word through newspapers, television, and live demonstrations, sharing the same thrills we experience every day with the people in our city and the world.

Stuyvesant Robotics has a long tradition of reaching out to media in our local community and beyond. We've appeared in the school newspaper, and the local Tribeca Tribune. During the 2009 New York City Regional, Michael 1, was featured on NY1 during a segment about robotics that reached millions in NYC. Team members also appeared on the Early Show on CBS to show support for the FIRST cause.

### Robotic Adventures at the FIRST Competition

Popular Science calls the New York City high school robot showdown a wild series of crashes, breakdowns, and mechanical kudos.

By Paul Lockner | March 20, 2009 | 4:10 PM EST



Michael 1, as seen on the Popular Science website.

The team also made an appearance in the technology magazine *Popular Mechanics* where our robot was the cover picture for the article “Rumble on the Hudson” about the New York Regional. Our media coverage goes beyond English language media. A local Chinese paper, Chinapress, also published an article about our build season. In 2007, a member of our team was interviewed by Lebanon-based Al Hurra TV, which broadcasts throughout the Arabic world. Our team has also been featured several times in the popular Chinese newspaper World Journal, which interviews team members about their experiences in engineering.

For Stuyvesant Robotics, it isn't enough for us to just develop ourselves. We feel obligated to show our community and neighbors all that young people can accomplish when they apply themselves.

By Mao Hu



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Funny Garbage

SHS Class of 1975 +/- Δ Asian Club

## Dedications

By Betsy Soukup

We owe our success to our dedicated mentors, who commute, discuss, and create alongside us during the build season and competition. In particular, we would like to thank our newest mentors, whose skills are what brought our robot to a new level.

**Mark Cohen** helped our team become more wired than ever. He repaired and then donated several laptops to our marketing and programming departments, which greatly increased the productivity of both. Mark also modified several desktop computers for the animation team's use.

**Dan Lavin** was integral in helping us use this year's new control system. He pored over manuals with us and contributed to everything electronics-related, including wiring signal lights and bringing in old security cameras to scrap for potentiometers. He was key in learning how to use the new camera and make precise movements in autonomous mode.

**Robert Lin** was our head animation mentor this year and made our fledgling team one of the strongest contenders for the Autodesk Visualization Award. He taught members the ins and outs of 3ds Max and encouraged the team to come up with their own models, a feature unique to Stuypulse's submission.

**James Potter** was invaluable to the engineering department this year. In the words of President Seth Berg, "When I first saw him, I thought he was an old mentor who decided to come back." Jim jumped right into the robotics spirit, attended numerous meetings and competitions, and offered innovative solutions that greatly improved the robot, such as the empty cell holder.

### 2009 Woodie Flowers Nominee, Joe Ricci

Stuyvesant alum and medical school student Joe Ricci is unparalleled as a mentor. He has been with the team for the past eight years, and his dedication and upbeat attitude have impressed robotics team members for generations. It's hard to believe that Joe contributes to every part of the robot, from the drivetrain to manipulators to autonomous code, comes to every meeting and competition, and is still at the top of his class. Joe Ricci is always working; if he's not actively helping with the robot, it's because he's building a new PVC corral or trying to tame the messiness of room 450. This year, Joe encouraged team members to begin prototyping early on in the season, and to test every design, no matter how unconventional. He saw the need for reinforcement in Michael 1 and helped triangulate his frame. Joe sat through countless runs of autonomous routines, which he helped tweak until they were perfect. On the field, Joe led our drive team and made Stuypulse the sixth-highest scoring team in the world in a competition that was totally unpredictable. The total impact Joe has had on this team, and on every one of its members, is enormous.



## Stuyvesant Robotics

We would like to thank all of our members, parents, and mentors for our best year yet!

### Faculty

Principal- Stanley Teitel  
Robotics Advisor-Rafael Colón  
Coordinator of Technology Education- James Lonardo  
AP of Technology- Raymond Wheeler

### Mentors

Peter Brooks, James Carpino ('89), Tom Ferguson, Ian Ferguson ('05), Mel Hauptman, Colin Holgate, Ron & Catherine Kunicki, Dan Lavin, Abigail Laufer, Adam Leeb, Robert Lin, Joe Ricci ('03), Andy Woo ('96)

### Parents

Derek Berg, Rita Dumain & Victor Broder, Mark Cohen, Malcolm Handte, Marlan & Miriam Ketani, Rita & Steven Meed, Janet Perr, James Potter, Fay Rosenfeld, Suzanne Shapiro, Pam & David Soukup, Beth Sugarman, Adele Ursone, Nancy & Jamil Yabroudi

### Executive Council

#### President of Marketing

Daryl Vulis

#### President of Engineering

Seth Berg

#### Director of Programming

Ariel Eisenstadt and Jordan Perr

#### Vice President of Marketing

Mao Hu

#### Vice President of Engineering

Betsy Soukup

#### Director of Outreach

Hans Zhou

#### Director of Engineering

Susan Zheng

#### Director of Procurement

Richard Meehan

#### Director of Fundraising

Jonathan Meed

#### Webmaster

David Sugarman

#### Primary Machinist

Adam Yabroudi

#### Secretary

Lunie Wong

#### Tournament Coordinator

Sarah Ketani

#### Director of Electronics

Emily Matteson

#### Director of Strategy

Joseph Blay

#### Director of Field Construction

Samantha Unger

#### Director of Safety

Jonny Lambert