

AN 18 YEAR OLD BOY FROM WESTERN ALAMANCE HIGH SCHOOL IN ELON, NORTH CAROLINA INVENTED:

# OPTIMIZED TURBINE BLADE EFFICIENCY

BY MANIPULATION BOUNDARY LAYER SEPARATION

THE STORY OF **ANDREW K. MILLER**



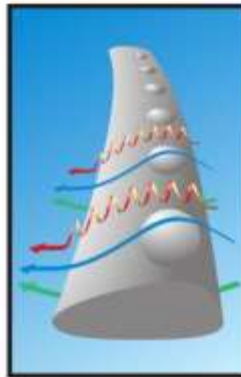
ANDREW GREW UP IN NORTH CAROLINA WHERE HE LEARNED TO LOVE THE OUTDOORS. HE AND HIS FAMILY DID LOTS OF HIKING, BACKPACKING AND CAMPING. HE ESPECIALLY ENJOYED HIKING IN COLORADO AND ALASKA.

ONE OF HIS FAVORITE HOBBIES IS BUILDING AND FLYING REMOTE-CONTROLLED MODEL AIRPLANES. HAVING TO TAKE APART AND REPAIR THE PLANES SPARKED AN INTEREST IN ANDREW TO TINKER, FIX AND BUILD, WHICH GAINED HIM THE FAMILY NICKNAME **MACGYVER**. HE ALSO REPAIRS EQUIPMENT FOR HIS UNCLE WHO IS AN ORTHODONTIST.

IN HIGH SCHOOL ANDREW WAS ACTIVE ON THE CROSS COUNTRY AND TENNIS TEAMS, AND HE PARTICIPATED IN THE SCIENCE AND HISTORY CLUBS. HE ENTERED SCIENCE FAIRS AND HIS RESEARCH WAS JUDGED AT ISEF TWO YEARS. HE ALSO PURSUED PHOTOGRAPHY AND VIDEO PRODUCTION.

BECAUSE OF HIS INTEREST IN AIRPLANES, ANDREW'S EARLY RESEARCH WAS ABOUT THE EFFECTS OF THE PLACEMENT OF **TUBERCLES** ON AIRPLANE WINGS. LATER ANDREW TRANSFERRED HIS RESEARCH TO BLADES OF WIND TURBINES SINCE THE POPULARITY OF SMALL RESIDENTIAL WIND TURBINES WAS GROWING.

TO TEST HIS THEORY OF TRYING TO IMPROVE WIND TURBINE PERFORMANCE BY APPLYING PROTUBERANCES TO PROPELLER BLADES, ANDREW AND HIS FATHER DESIGNED AND BUILT A SMALL WIND TUNNEL OUT OF A THREE FOOT CULVERT PIPE, USING A CONSTRUCTION FAN AS THE WIND SOURCE. THEY WERE CHALLENGED TO CREATE A LAMINAR FLOW.

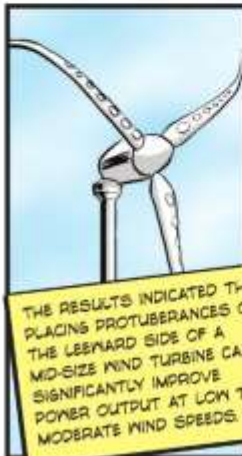


A HONEYCOMB PATTERN DEVICE WAS CONSTRUCTED USING OVER **500 PLASTIC STRAWS** TO CREATE THE STREAMLINE AIRFLOW.

EVENTUALLY HIS OPTIMUM CONFIGURATION WAS FIELD TESTED ON A DOWNWIND, HORIZONTAL 19 KW WIND TURBINE, THE SKYSTREAM 32

ANDREW HAS WON MANY AWARDS, INCLUDING **THE INTEL SCIENCE & ENGINEERING FAIR, THE U.S. AIR FORCE FIRST PLACE AWARD IN ENERGY AND TRANSPORTATION, THE RICHMOND SUSTAINABLE DEVELOPMENT AWARD, AND THE GENERAL ELECTRIC EDISON AWARD**. HE CURRENTLY HAS A PATENT PENDING FOR WIND TURBINE BLADES AND WIND TURBINES.

ANDREW IS PRESENTLY A FRESHMAN AT NC STATE WHERE HE IS STUDYING BIOMEDICAL ENGINEERING.



THE RESULTS INDICATED THAT PLACING PROTUBERANCES ON THE LEeward SIDE OF A MID-SIZE WIND TURBINE CAN SIGNIFICANTLY IMPROVE POWER OUTPUT AT LOW TO MODERATE WIND SPEEDS.





A 19 YEAR OLD GIRL FROM WARD MELVILLE HIGH SCHOOL IN SETAUKET, NEW YORK INVENTED:

# COMBATting CANCER: DESIGN &...

...SYNTHESIS OF DUAL-WARHEAD TUMOR-TARGETING DRUG CONJUGATES

THE STORY OF **PREYA SHAH**

PREYA SHAH IS A MATH WHIZ WHO, AS A FRESHMAN IN HIGH SCHOOL, STUDIED DNA IN HER SPARE TIME. IN HER SOPHOMORE YEAR, SHE WORKED TO DEVELOP A BIOCOMPATIBLE SCAFFOLD ON WHICH TO GROW SKIN CELLS FOR HEALING WOUNDS. THEN IN HER JUNIOR YEAR SHE CONTINUED HER DNA EXPERIMENTS.



FINALLY IN HER SENIOR YEAR, AFTER SPENDING 40 HOUR PLUS WEEKS OF HER SUMMER IN THE LAB AT STONY BROOK UNIVERSITY, SHE WAS INSPIRED TO DO SOMETHING TO HELP CANCER PATIENTS.

AS A RESULT, SHE WAS INSPIRED TO DESIGN AND SYNTHESIZE A NEW CHEMOTHERAPY DRUG TO FIGHT TUMORS WITH FEWER SIDE EFFECTS. *IT USES ONE MOLECULE THAT FIGHTS THE CANCER ON TWO DIFFERENT FRONTS*, SAYS PREYA.

PREYA IS ALSO VERY INTERESTED IN MUSIC. SHE PLAYS THE VIOLIN AND OBEO AND ENJOYS SINGING.

SHE HAD VOLUNTEERED SINCE HER EARLY CHILDHOOD FOR VARIOUS CANCER-RELATED EVENTS, INCLUDING THE *WALK FOR BEAUTY* FOR FIGHTING BREAST AND PROSTATE CANCER.



SHE IS NOW ACTIVE IN THE HARVARD CHORAL GROUP



SHE HAS VOLUNTEERED FOR THE HERITAGE CORPORATION, WHICH FOCUSES ON HISTORICAL AND ENVIRONMENTAL PROJECTS. WHILE IN HIGH SCHOOL SHE WAS A MEMBER OF THE *SCIENCE OLYMPIAD* AND THE *SCIENCE BOWL*.

HER HARD WORK RESULTED IN A SCHOLARSHIP FROM INTEL INTERNATIONAL WHERE SHE WON *FIRST PLACE GRAND AWARD* IN 2009, AND *THE INTEL SCIENCE TALENT SEARCH FINALIST & 8TH PLACE WINNER*, ALSO IN 2009. HER OTHER OUTSTANDING AWARDS INCLUDE *THE SBABORS GYSS AWARD FOR IDEP*, *THE AMERICAN CHEMICAL SOCIETY AWARD*, *THE OFFICE OF NAVAL RESEARCH AWARD*, AND *SIEMENS COMPETITION 2008 REGIONAL FINALIST AWARD*.



SHE IS PRESENTLY ATTENDING *HARVARD* WHERE HER GOAL IS TO MAJOR IN SCIENCE TO IMPROVE BOTH HEALTH AND MEDICAL APPLICATIONS.



A 13 YEAR OLD GIRL AND 16 YEAR OLD BOY FROM METHACTON HIGH SCHOOL IN AUDUBON, PENNSYLVANIA INVENTED:

# AN EARLY DETECTION OF CANCER

DEVELOPMENT OF A URINE TEST FOR THE EARLY DETECTION OF CANCER



## THE STORY OF **JANET AND BENJAMIN SONG**

JANET AND BENJAMIN WERE RAISED IN THE PHILADELPHIA AREA AND LEARNED TO PLAY THE VIOLIN AND PIANO. THEY HAVE PERFORMED PIANO CONCERTS IN **CARNEGIE HALL** SINCE THEY ARE QUITE ACCOMPLISHED IN MUSIC, THEY HAVE BEEN INDUCTED INTO THE **TRIM MUSIC HONOR SOCIETY**.

IN HIGH SCHOOL **JANET** WAS PRESIDENT OF NATIONAL MOCK TRIAL AND TRIM. SHE WAS CONCERT MASTER IN HER HS ORCHESTRA AND A 2009 PRESIDENTIAL SCHOLAR. SHE PARTICIPATED IN THE RESEARCH SCIENCE INSTITUTE AT **MIT** IN THE SUMMER OF 2007 WHERE SHE WAS RECOGNIZED AS **TOP FIVE** PRESENTER.

**BENJAMIN** IS ACTIVE ON HIS SCHOOL'S ACADEMIC DECATHLON TEAM, AND HIS FAVORITE SUBJECT IS BIOLOGY. HE ENJOYS PLAYING BASKETBALL WITH FRIENDS. BENJAMIN AND JANET BOTH LIKE ALPINE SKIING.

WHEN JANET AND BENJAMIN'S GRANDFATHER DIED OF LIVER CANCER, THEY KNEW THAT THEY WANTED TO DO RESEARCH IN MEDICINE STUDYING CANCER.



THEY APPLIED FOR INTERNSHIPS AT DREXEL UNIVERSITY AND REQUESTED A PROJECT LINKED TO CANCER.

THEIR PROJECT WAS TO DEVELOP A SIMPLE URINE TEST WHICH COULD PROVIDE EARLY DETECTION OF CANCER. THEY DEVELOPED A NOVEL METHOD TO PREPARE CIRCULATION-DERIVED URINE DNA FOR GENETIC TESTING FOR HIGHER SENSITIVITY AND SPECIFICITY, AND REAL-TIME PCR BASED ASSAYS FOR DETECTING COLORECTAL CANCER (CRC)-ASSOCIATED GENETIC AND EPIGENETIC DNA BIOMARKERS IN URINE.

JANET AND BENJAMIN HAVE WON MANY AWARDS INCLUDING **1ST PLACE** IN THE 2009 **INTEL INTERNATIONAL SCIENCE AND ENGINEERING FAIR**, SEMI-FINALIST IN THE 2007 AND 2008 **SIEMENS COMPETITION**, IN 2007 **A DAVIDSON FELLOW**, AND SEMI-FINALIST IN THE 2007 **DISCOVERY CHANNEL YOUNG SCIENTIST CHALLENGE**.

**JANET** IS CURRENTLY A FRESHMAN AT HARVARD UNIVERSITY STUDYING MOLECULAR AND CELLULAR BIOLOGY (MCB). AFTER COLLEGE SHE WANTS TO CONTINUE RESEARCH IN A BIO-MEDICAL RELATED FIELD IN ORDER TO ADVANCE OUR UNDERSTANDING OF HUMAN DISEASE.

**BENJAMIN** WOULD LIKE TO ATTEND MIT OR THE UNIVERSITY OF PENNSYLVANIA TO MAJOR IN BIOLOGY AND PRE-MEDICINE. HE WANTS CAREER IN WHICH HE CAN HELP PEOPLE AND BENEFIT SOCIETY.



THEY HAVE TWO PATENTS PENDING.



© 2009 THE NATIONAL MUSEUM OF EDUCATION

WRITER: SUE LYONS / ARTIST: WARREN BECKER



A 17 YEAR OLD GIRL FROM MCCURDY HIGH SCHOOL IN ABIQUIU, NEW MEXICO INVENTED:

# ULF COMMUNICATIONS

REACHING THE SURFACE (A ULF COMMUNICATION DEVICE FOR TRANSMITTING THROUGH THE EARTH)

THE STORY OF **SOPHIE MARIE SWINGLE**

ALTHOUGH SOPHIE SWINGLE WAS BORN IN SAN DIEGO, CA, SHE HAS SPENT THE MAJORITY OF HER LIFE ON A RATHER LARGE RANCH IN ABIQUIU, NM WHERE SHE HAS MANY ANIMALS. WITH 8 HORSES, 5 BIRDS, 5 CATS, AND 4 DOGS IT'S EASY TO IMAGINE THAT CARING FOR THIS "FAMILY" TAKES A LOT OF TIME.



**SOPHIE** IS OBVIOUSLY A SENSITIVE YOUNG WOMAN WITH A HUMANITARIAN SPIRIT. WHEN SHE SAW THE STORY ON THE NEWS ABOUT THE CRANDALL CANYON MINE CAVE-IN IN UTAH IN AUGUST OF 2007, SHE WONDERED:

WHY CAN'T MINERS COMMUNICATE WITH THE SURFACE RESCUERS TO LET THEM KNOW THEIR LOCATION AND ASSURE THOSE ON TOP THAT THEY'RE OK.



THIS BEGAN SOPHIE'S DESIRE TO FIND A WAY TO TRANSMIT THROUGH THE EARTH.

THE RESULT WAS HER **ULF COMMUNICATION DEVICE FOR TRANSMITTING THROUGH THE EARTH**. THIS INVENTION REQUIRED A GREAT DEAL OF RESEARCH IN COLORADO AND NEW MEXICO, AND THE HELP OF THOSE WHO COULD PROVIDE THE TECHNICAL EQUIPMENT NEEDED FOR TESTING.

WHEN YOU SEE SOPHIE IN THE FIELD READY FOR HER DIFFICULT RESEARCH AND TESTING, IT MIGHT BE HARD TO IMAGINE THAT SHE IS CONFIDENT TO SAY THAT SHE IS REALLY **A GIRLY GIRL**, AND HOW APPROPRIATE IT IS THAT HER FAVORITE COLOR IS **PINK!**

SOPHIE IS TRULY A WELL-ROUNDED YOUNG WOMAN. SHE IS THE CAPTAIN OF HER VOLLEYBALL TEAM, IS ON A PISTOL TEAM, AND DOES TAEKWONDO. BUT DON'T MISTAKE THIS ROUGH AND TOUGH EXTERIOR; SHE IS VERY MUCH A GIRL WHO LOVES SHOPPING.

SHE HAD MUCH TRIAL AND ERROR BEFORE HER SUCCESSFUL INVENTION.




SOPHIE HAS HAD THE OPPORTUNITY IN HER LIFE TO VISIT SEVERAL EUROPEAN COUNTRIES: FRANCE, HOLLAND, AND BELGIUM WITH HER GRANDPARENTS. SHE IS EXCITED ABOUT HER PLANS FOR HER FUTURE.



WITH HER 4TH PLACE WIN IN ELECTRICAL & MECHANICAL ENGINEERING IN 2009 IN **THE INTEL INTERNATIONAL SCIENCE FAIR**, SOPHIE'S ACCOMPLISHMENTS WILL DEFINITELY ENHANCE HER OPPORTUNITIES FOR COLLEGE.

HER GOAL IS TO ATTEND THE NAVAL ACADEMY AT ANNAPOLIS WHERE SHE WILL STUDY AEROSPACE ENGINEERING TO BECOME A NAVY PILOT. HER GRANDFATHER IS A RETIRED NAVAL OFFICER. NO DOUBT HE WAS HER INSPIRATION.





A 6-YEAR OLD BOY FROM RIVERSIDE MEADOWS INTERMEDIATE IN PLUMAS LAKE, CALIFORNIA INVENTED:

# LOCK-N-BLOCK

SLIDING DOOR SAFETY GATE

## THE STORY OF THARON TRUJILLO

THARON TRUJILLO WAS AN ACTIVE CHILD AND GREW UP LOVING THE OUTDOORS. HE ENJOYS GOING FISHING AT PLYMOUTH LAKE AND CATCHING LARGE-MOUTH BASS AND TROUT.



IN SCHOOL THARON FINDS MATH FUN AND CHALLENGING. AS A TYPICAL BOY HIS FAVORITE SUBJECT IS PHYS. ED, AND HE LOVES PLAYING FOOTBALL AND BASKETBALL.

BASKETBALL HAS BECOME HIS FAVORITE, AND HE PARTICIPATES IN LEAGUES AND CAMPS AT THE **HARDWOOD PALACE** IN SACRAMENTO WHERE FORMER **KINGS** PLAYERS SPONSOR THE WORKSHOPS.

THARON IS CLOSE WITH HIS LITTLE SISTER, AND HE WATCHES OUT FOR HER. WHEN SHE WAS YOUNG, SHE TRIPPED ON A RUG NEAR A SLIDING GLASS DOOR AND FELL FACE FIRST INTO THE SCREEN.



THIS UPSET THARON, AND HE TOLD HIS DAD, **"WE NEED SOMETHING TO PROTECT US NEAR THE SLIDING GLASS DOOR!"**

AFTER SEARCHING THE INTERNET AND GOING TO HOME IMPROVEMENT STORES, THARON DECIDED TO INVENT SOMETHING HIMSELF. HE USED A WOODEN EXPANDABLE GATE AND TRIED VARIOUS ADAPTATIONS. BUT EVERY TIME THE SLIDING DOOR MOVED, THE GATE WOULD FALL.

NEXT HE DESIGNED A CLAMPING MECHANISM THAT ATTACHES TIGHTLY TO THE DOOR AND THIS SOLIDIFIED HIS INVENTION MAKING IT STABLE FOR ANY SLIDING GLASS DOOR.

HIS **LOCK-N-BLOCK SLIDING DOOR SAFETY GATE** WON FIVE AWARDS AT THE **INVENTION NEMO PRODUCT EXPOSITION 2007** WHEN HE WAS 10 YEARS OLD, THE **2008 JUVENILE PRODUCTS MANUFACTURER'S ASSOCIATION INNOVATION AWARD**, THE **2009 FIT PREGNANCY EDITOR'S CHOICE AWARD** AND THE **2009 JPMA AWARD FOR WINDOW GUARDS**. THARON HAS A PATENT PENDING.



© 2009 THE NATIONAL MUSEUM OF EDUCATION

WRITER: SUE LYONS / ARTIST: WARREN BECKER



MICHAEL VAWTER, 13, MICHELLE VAWTER, 15, AND MARK D. WRIGHT, 15, FROM EDISON ACADEMY IN WESTERVILLE, OHIO INVENTED:

# NANO MIST

THE STORY OF MICHAEL, MICHELLE AND MARK

MICHAEL VAWTER WAS 10 WHEN HE CREATED HIS FIRST INVENTION, THE **ROBO SWITCH**. IT IS A DEVICE THAT USES LIGHT MOTION AND TEMPERATURE SENSORS TO AUTOMATICALLY TURN OFF THE LIGHTS WHEN YOU LEAVE A ROOM. MICHAEL WAS GETTING INTO TROUBLE FOR LEAVING LIGHTS ON, SO HE THOUGHT ABOUT BUILDING A ROBOT WHICH WOULD HANDLE THE PROBLEM.



THIS **ROBO SWITCH** WON THE AWARD FOR THE COLUMBUS, OHIO AREA **INVENTION CONVENTION** IN 2004 AND ALSO WON **THE CHRISTOPHER COLUMBUS AWARDS**...

TWO YEARS LATER **MICHAEL VAWTER** AND HIS SISTER, **MICHELLE**, ALONG WITH **MARK WRIGHT** BEGAN WORKING ON ANOTHER ROBOTICS INVENTION...

THE INVENTION SPIRIT HAD TOUCHED ALL THREE OF THEM. HOWEVER, MARK AND MICHELLE MADE AN INVENTION TOGETHER CALLED **THE COLD CONQUERER** IN 2008.



...WHICH TOOK THEIR TEAM TO **DISNEY**, ORLANDO FOR A WEEK, WHERE THEY WERE FORTUNATE ENOUGH TO SEE BEHIND THE SCENES TO LEARN ABOUT HOW THE WORLD OF DISNEY WORKS.



THIS TIME THEY WERE HONORED TO WIN **1ST PLACE** OUT OF 10,000 TEAMS FROM 39 COUNTRIES. NOT CONTENT WITH ONE WIN, THEY AGAIN PLACED **1ST** FOR THE SECOND TIME IN THE ATLANTA, GA, **ROBOTICS COMPETITION**.



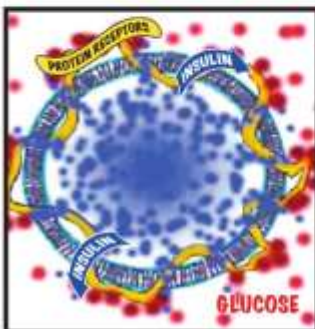
THE WORK OF ALL THREE INVENTORS ON **NANO-MIST** HAS BEEN SEVERAL YEARS IN DEVELOPMENT. ONCE THEY WALKED IN THE **JDRS-MALKATHON FOR JUNIOR DIABETICS**, THEY FELT PARTICULARLY INSPIRED AND WERE MOVED BY THE STATISTICS OF THE GROWING NUMBERS OF DIABETICS IN THE WORLD.

THEY INVENTED A **NANOSCOPIC NASAL SPRAY** THAT USES PROTEIN RECEPTORS TO DETECT EXCESS SUGAR IN THE BLOOD AND THEN RELEASES THE APPROPRIATE AMOUNT OF INSULIN TO WARD OFF A DIABETIC ATTACK. THIS INVENTION WON **2ND PLACE** IN THE **EXPLORAVISION COMPETITION** SPONSORED BY NSTA. THEY HAVE THREE PATENTS PENDING.

WITH ALL OF THIS RESEARCH AND FOCUS ON INVENTION, IT IS HARD TO BELIEVE THAT EACH OF THEM HAS TIME FOR OTHER THINGS. YET, **MICHAEL** HAS A BAND IN WHICH HE PLAYS GUITAR, PIANO AND SINGS. AND HE IS TRULY A "RENAISSANCE YOUNG MAN", WHO BALANCES THE ARTS & SCIENCE. HE EVEN FINDS TIME TO FENCE AND COMPETE IN LOCAL TOURNAMENTS.

HIS SISTER, **MICHELLE**, ALSO LIVES A VERY BUSY LIFE. SHE IS ON THE SCHOOL TENNIS TEAM AND SINGS SOPRANO AT HER CHURCH.

**MARK** IS QUITE ACTIVE AS WELL. HE MANAGES TO PLAY BOTH BASKETBALL AND JUST PLACED IN THE STATE IN GOLF.



THESE EXTREMELY ACTIVE YOUNG FRIENDS HAVE BEGUN TO FOCUS ON THEIR GOALS. **MICHAEL** PLANS TO STUDY ENGINEERING OR NEURO-SCIENCE WHEN HE ENTERS COLLEGE. HE HAS HAD INTEREST FROM 5 COLLEGES, BUT IS STILL CONSIDERING HIS OPTIONS.

**MICHELLE** HASN'T QUITE HONED DOWN HER GOALS YET, BUT SHE FEELS IT WILL SURELY BE IN THE SCIENCES OR MEDICINE.

AND **MARK** STILL HAS TIME TO DREAM, BUT HIS VISION INCLUDES BUSINESS AND THE GOAL OF INVENTING!