

# Alabama Graphite Finds Natural Graphene: Accidents + Weird Science = Dollars

Dr. Andy Geim at the University of Manchester is the kind of prof we all wanted. Perceptive on a different level of smart, great communicator, multilateral thinker, and a meaningful teacher. His informal Friday sessions (involving a fermented brown beverage) became the stuff of legend, inviting students to think about science for science's sake – not to drive a research grant, not to play university politics, but just for the love of science.



Some of it resulted in weird science. Dr. Geim won the 2002 Ig Nobel award for magnetically levitating live frogs. The demonstration was silly and fun (look up a video of it); the science behind it was cutting edge.

Apparently, science can be rewarding as well as fun. In 2010, Dr. Geim took home the Nobel Prize in Physics and its massive cash prize for discovering “graphene”. Dr. Geim and his frog became minor celebrities, heroes to the *Wired* magazine demographic.

That prize-winning work is probably best characterized as an intentional accident. Graphene had been theoretically predicted, but at the time Dr. Geim wasn't actually searching for graphene. He did direct part of his U of M research team to obtain as thin a sample of graphite as possible. Graphite is part of the carbon family. The team's intentional efforts were a qualified success, but the accidental part was to find some graphite stuck to a ball of scotch tape. The research

team looked at the graphite, looked at the tape ball, looked at the graphite, looked at the tape ball ... folded the tape, pressing the graphite residue together, then pulled it apart again. They continued this fold, press, separate routine, to peel the graphite flakes down thinner and thinner.

Red Green would have been proud.

Eventually, other equipment scraped the honey-comb shaped material down to being one atom thick. And that was graphene, an intentional accident. Some refer to graphene as "two-dimensional material", but it does exist in the third dimension, even if only one atom thick.

Graphene is a superhero to the periodic table. Assume a thread of graphene one million times thinner than a hair on your head. That thread is stronger than steel, a thousand times more electrically conductive than copper or silicon, less resistive than silver, more thermally conductive than diamond, flexible enough to be stretched up to 120% in length and still retain its strength, able to repair holes in itself when exposed to other carbons, and is impermeable. All that at one atom thick. And because it's only one atom thick, it's transparent and flexible.

Once science knew that graphene could be made, high quality graphene was surprisingly easy to create if expensive. The global market is still relatively small (less than USD\$10M a year). That may soon change, and this is where money will be made.

Where will the market for graphene develop? Graphene is the likely candidate to use in photovoltaic cells. It also can be integrated anywhere, into anything, that requires a touch screen. Picture a shirt with a monitor on the sleeve, or the science fiction movies with monitors that roll up and go into your suitcase like paper. No more broken phone screens. Carry your 60 inch TV to the next room with you.

It could be used as a superconductor, at room temperature. It can carry more electricity with almost no waste and more precision than any other material. So plug in your tablet and it's charged in 30 seconds, with no waste heat. The electrical applications are limitless.

The sports adaptations are endless as well, from cricket bats to canoes to golf clubs. It can be used to filter salt water, making it potable. Pure sound from headphones. No need for heavy longlife batteries. Electric circuits. Artificial limbs – welcome to the bionic man! A lubricant. A sound barrier. A radio wave barrier. Microscopic antennae. Waterproof anything. Graphene is all of that and more.

Samsung not surprisingly seems to be the world leader in applied graphene research, but NOKIA and Dr. Geim can't be far behind. What will change this industry, the way plastics changed the world, is if a better cheaper source of graphene can be found. Then we could be looking at a similar fundamental change in economics, as graphene applications roll out and other applications become obsolete.

And that brings us to another intentional accident. Today [Alabama Graphite](#) announced it had found the world's first natural source of graphene. **Not graphite, graphene.** The mind boggles.

Applied science will eventually tell us if AG is right about its graphene, just as science is still trying to figure out Zenyatta Venture's graphite find in northern Ontario. (What is it about graphite and accidents? Zenyatta wasn't exploring for graphite but it found a unique hydrothermal-style graphite deposit where no one would ever have looked for it.)

AG's Coosa and Bama deposits are in Alabama, best known for cheerleaders, the Crimson Tide, and being one of the high-tech capitals of the southern US. Field work since 2012 targetted flake graphite. Based upon minimal drilling at Coosa, in

Aug/13 AG published an NI 43-101 indicated resource of 38.16 million tons at 2.6% Cg and an inferred resource of 26.99 million tons at 2.87% Cg, making it the largest known indicated resource in the United States. (Note: Cg is not an element on the periodic table so please pull the entire report from SEDAR for context.)

Today's announcement, another intentional accident, changes the game entirely. If AG is right, the world may have its cheap source of graphene, and the scientists from around the world will flock to 'bama to get a sample. Applied practical research and the roll-out of new products will follow. Existing companies that sell products based on old technology will have to adapt or die. Despite marketing claims, there are few truly revolutionary discoveries that have the capacity to change our lives – AG's deposit could be one of them. How you live your life in 10 years might depend on what's in AG's properties.

I was unable to contact management for clarification on a few points in the press release. It appears they suffered from another intentional accident, being a premature release of the news prior to halting the stock. Given the timing and the substance, they are likely busy fielding calls from major media outlets, research labs and regulators. An update to this will be posted after I get substantive answers.

In the meantime, maybe the best investment play is to buy every graphite company and wait for it to find something else? As Dr. Geim showed us, accidents + weird science = \$\$\$.