Welcome to the Technology Development Center 2014 Annual Report. In September, 2011, OSU filed a patent application on a method of producing a new kind of steak, as well as the resulting steak itself. The so-called Vegas Strip steak. Believe it or not, the Vegas Strip has never existed before. Now, it may have been made accidently sometime in the last 50,000 years, but if so, there is no proof. Nowhere has it been written down, and nowhere has it been offered for sale. It comes from a part of the cow under the shoulder blade (the Subscapularis muscle) that is normally converted into hamburger or left on the carcass to become part of another cut of meat known as the “chuck.”

This METHOD for producing the Vegas Strip, as well as the steak that results, actually satisfies the three criteria for patentability: novelty, unobviousness, and utility. Novel because no one has done it before, at least as far as we know; unobvious because it is not an obvious extension of what the world already knows; and useful, because, well, it is a steak, it tastes good, and conservatively it adds perhaps an additional $2 to the value of a beef carcass in an industry that is scrambling for pennies. Seems useful to me.

Now, applying for patents is something we do all the time at OSU, about 15 per year. And normally they are not controversial—new vaccines, machines, etc. But applying for this steak patent caused a real stir in the blogosphere. You’d think we had violated a law of the universe. The vast majority of the comments/objections were variations on the theme of, “You can’t patent a steak!”


So clearly we can, theoretically, patent a steak—if it is novel, unobvious, and useful.

But perhaps the objection is not so much based on whether you can technically patent a steak, but whether you should. Some people seem to think such a patent is a tad unethical—like maybe, well, steaks belong to everyone. Or as one commentator wrote, “You mean you are going to sue me when I eat my steak?” Or maybe due to the fact that the subscapularis muscle is produced by a cow, the steak produced from that muscle is thought to be a “natural product,” and patenting a “natural product” bothers folks at some deep intuitive level. This is akin to the fuss back in the 1980’s about patenting plants and animals (“But you can’t patent life!”). Or the disputes in the 1990’s and 2000’s about patenting DNA. I would argue that the answer is “yes,” if the isolated steak satisfies the criteria of novelty, unobviousness, and utility and its final form is different from that in which it exists in the animal.

And that is because the Vegas Strip steak has actually been “abstracted,” (cut out of) the subscapularis muscle, and looks nothing like that muscle does when it is still inside the animal—much as Michelangelo’s statue of David looks nothing like the chunk of Carrara marble that it came from.

So there. You can patent a steak. I think. We will know for sure in 2-3 years, which is the amount of time that the U.S. Patent and Trademark Office generally takes to decide such things.

[Dr. Price publishes a periodic blog on technology, science, and intellectual property, It can be found at http://tdc.okstate.edu/blogs/dr-steven-cprice]
TDC
FY 2014 - At A Glance

- 6 Licenses Executed
- 11 Issued Patents
- 52 Disclosures
- 46 Licenses Yielding Income
- $2.29M in Income from Licenses
Since program inception in 2005, TBDP has funded $2,176,119 and generated:

- $7,327,998 in follow-up funding
- 218 Proposals
- 84 Disclosures
- 168 Student Jobs
- $3.36 for every $1.00 invested
Roll-2-Roll, LLC and the OSU Entrepreneurial Ecosystem

“We are working to build an ecosystem of entrepreneurship through innovation at OSU,” says Daniel Will, executive director of Cowboy Technologies, an OSU-owned company that helps university faculty and students in commercializing university technology through startup companies. “Cowboy Technologies, the Technology Development Center and the Spears School of Business are significant resources available to OSU students and faculty who have the ideas and the persistence to commercialize technology through successful startup businesses.”

Mechanical engineering student Aravind Seshadri, who came to Stillwater to earn a master’s degree, joined mechanical and aerospace engineering professor Prabhakar Pagilla’s research group to work on projects at OSU’s Web Handling Research Center, an industry partnership established to improve manufacturing using web, or roll-to-roll machines. Pagilla and Seshadri developed improved sensor and control technology for web machine lateral guides, the devices that keep materials in-line during the high-speed manufacturing process, reducing downtime for manual realignment that wastes time, material and money. Their patented fiber optic sensor and control system detects the position of the web and automatically controls material alignment.

While working on his doctorate, Seshadri enrolled in a class on entrepreneurship for engineers and scientists offered by the School of Entrepreneurship at the Spears School, where he learned the basics of developing a viable business plan for a technology startup.

“I took the class out of curiosity,” Seshadri says. “I’m an engineer. I didn’t know anything about business, but I’ve always been curious to try new things.”

In 2011, Seshadri was accepted into the Creativity, Innovation, and Entrepreneurship (CIE) Scholars Program at the Riata Center, joining a team assigned to develop a business plan to commercialize the fiber optic sensor technology. Though it was a good learning experience, the team decided that a business making and selling the sensor wasn’t likely to succeed.

Enter i2E, Inc., an Oklahoma nonprofit that mentors tech startups and receives funding from the state’s Oklahoma Center for the Advancement of Science and Technology (OCAST). The Roll-2-Roll founders further refined their business model in i2E’s 10-week Oklahoma Proof of Concept program. As part of the program, they contacted more than 100 potential customers, quizzing them on their needs to understand what the minimum viable product that is needed in the real world. Seshadri talked with an Italian company that is one of the world’s largest manufacturers of roll-to-roll diaper machines. The experience was eye-opening.

“Most manufacturers don’t develop their own technologies. They rely on others to provide them with technology,” Seshadri says. “I realized that this is an opportunity for us.”

Seshadri wants Roll-2-Roll to become the company providing technology solutions to roll-to-roll manufacturers.

Along the way, OSU’s Technology Development Center provided gap funding through the Technology Business Development Process (TBDP) to get the technology from a lower Technology Readiness Level to a higher one that is closer to the minimum viable product. Three rounds of funding were awarded over a five year period that amounted to nearly $90,000. This type of funding is necessary to help inventors get their technology into a commercially viable form.

“Our company is called Roll-2-Roll Technologies. It isn’t called the lateral guide company because we want to be in the business of providing intelligence for roll-to-roll machines,” Seshadri said. “The device itself, we’ll have someone make for us, but we’ll focus on the secret sauce, the algorithm that controls it.”

With confidence building in the first proof of concept prototype and a sound business plan in place, Roll-2-Roll raised more than $520,000 of seed investment in July from Cowboy Technologies, i2E, Inc., and a group of “angel” investors, individuals who provide investment capital for startups. The company founders also contributed their own money. In August, OCAST awarded Roll-2-Roll a two-year grant of nearly $300,000 that will continue to fund its technology development.
Molecules containing fluorine are important for the creation of many commercially successful drugs and agrochemicals. Inclusion of a fluorine atom can make a molecule more stable and improve a drug’s bioavailability and pharmacokinetic profile. Fluorine incorporation can thus make the difference between developing a blockbuster pharmaceutical and one that fails to provide any benefit. The hurdle that researchers often face is the difficulty in synthesizing compounds with fluorine. Recently, a team of Oklahoma State University chemists has discovered a novel, easily replicable method to synthesize valuable compounds containing fluorine.

“There are very few naturally occurring small molecules that contain carbon–fluorine bonds,” said Dr. Jimmie Weaver, an Oklahoma State University assistant professor of chemistry. “However, if you do make a molecule with a carbon–fluorine bond, it often imparts really remarkable properties to the molecule. For example, the inclusion of a single fluorine atom to cortisol (a naturally produced steroid) leads to a molecule known as Fludrocortisone with a 10-fold increase in therapeutic index.”

Additionally, they’re chemically robust and less sensitive to oxidative degradation, which is a primary strategy that the body uses to remove compounds. An example of a pharmaceutical that would benefit from partially fluorinated molecules is one that is cleared too quickly from the body by the liver to be effective. Often by substituting oxidatively sensitive positions with fluorine, the lifetime of a drug in the body can be extended and its concentration increased.

Weaver leads the OSU laboratory that has developed a method to synthesize per- and polyfluoroarylation of Mel drum’s acid adducts, which serve as a new type of fluorinated building block. According to Weaver, three of the five top-selling drugs contain fluorine, including the cholesterol treatment Lipitor and the type II diabetes drug Januvia. Though Januvia, made by Merck, contains highly desirable partially fluorinated arenes, the process to install the fluorines within the molecule is difficult and not environmentally friendly.

“The trifluorinated starting material requires seven or eight synthetic steps to make and the process is relatively harsh and unpleasant to perform,” said Weaver. “Making molecules with carbon–fluorine bonds is one of the most difficult to synthesize.”

Despite its difficulty, traditionally chemists have relied on the selective installation of fluorine to create the desired partially fluorinated molecules. Weaver and his colleagues have developed a novel method to solve the problem. “We’ve approached this from a very different direction,” he said.

Instead of starting with a molecule and attempting to selectively make carbon–fluorine bonds, Weaver’s research group starts with readily available molecules containing many fluorine atoms and using selective defluorination (or fluorine removal) to arrive at a molecule with multiple C-F bonds in the desired locations. “In contrast to partially fluorinated molecules, fully-fluorinated molecules are relatively accessible starting materials. The challenge becomes selective removal of the undesired (or extra) fluorines.”

This direction in creating partially fluorinated arenes has been pursued by other researchers, but with little success. Weaver and his colleagues realized a breakthrough in the method of removing fluorines selectively, which they described in a well-received article published in the Journal of the American Chemical Society in February 2014 (J. Am. Chem. Soc. 2014, 136, 3002). Their breakthrough demonstrated the ability to quickly remove multiple carbon–fluorine bonds and to do it in a way that can be scaled to produce quantities of compounds that make commercial production viable.

“What I like to point out is that using traditional methods may work well for installing one fluorine, but when you want a molecule with two or three fluorines, such as Januvia, this becomes a really complex molecule for which the traditional methods are not well suited,” Weaver said.

With assistance from Oklahoma State University’s Technology Development Center, Weaver received a Technology Business Development Program grant for continued research into the commercial viability of producing compounds that would be sold to companies that provide needed chemicals for the pharmaceutical, agrochemical and materials industries. To date, the chemical company Aspira Scientific has agreed to a license and placed Dr. Weaver’s compounds in their library for sale, and multiple others have expressed interest in licenses to buy compounds. A provisional patent has been applied for by the TDC.

“We’ve successfully developed inroads into C–F functionalization which dramatically expands the number and types of substitution patterns that we can make to arrive at partially fluorinated arenes and this should enable a number of scientists to make important advancements in various fields,” said Weaver.
The OSU App Center is a campus-wide resource for university faculty and students interested in developing and commercializing mobile applications. The App Center also organizes an annual OSU student-centric app development competition for corporate sponsors.

The OSU App Center opened for business in the lobby of the Henry Bellmon Research Center in 2013 with the support of its founding sponsor, AAA Oklahoma. The App Center is a one-stop resource center for turning ideas into apps, including funding. Any student or faculty member may submit their app idea for funding consideration. The App Center does market analysis research for each submitted idea, which is then considered by a steering committee of OSU faculty and staff. If an idea is approved, the committee awards the creators of the app idea with funding and services from App Center programmers and graphic designers. The App Center staff will work with creators to develop a commercially viable app.

The App Center employs student app developers and graphic designers, under the guidance of the steering committee members, to create the user Interfaces and complete programming of the funded app. When they are not programming and designing apps, student employees are busy answering questions about the process of developing an app from scratch.

To date, the App Center has funded and developed seven apps, the first of which was recently added to Apple’s App Store. Canopeo, an app which measures green canopy cover for crops, was conceived by soil science graduate students and faculty from the Division of Agriculture Sciences and Natural Resources.

Besides supporting on-campus app development, the OSU App Center also hosts an annual app competition for students to win prizes for submitting innovative app ideas. The App Center is currently running its 3rd annual app competition, with the theme of Insurance Telematics, sponsored by CSAA Insurance Group. $21,000 of prize money is awarded to the students who come up with the best app ideas and best developed apps based on the given theme. The center is planning to engage with local and state corporate companies to sponsor next year’s app competition.

AAA Oklahoma has recently increased its financial support for the OSU App Center. AAA Oklahoma agreed to provide $190,000 for App Center operations and mobile app development through 2017.

The App Center steering committee includes Blayne Mayfield, associate professor of computer science; Phil Choo and Patrick Finley, associate professors of graphic design; Bryson Baker, manager of Orange Tech at the Student Union; Megan Horton, associate director of OSU Communication Services; Craig Watters, director of the Riata Center; Jai Rajendran, manager, Technology Development Center; and Steve Price, associate vice president for technology development and director of the Technology Development Center.

For information about applying for a development grant visit https://appcenter.okstate.edu/ or talk to App Center interns in the lobby of the Henry Bellmon Research Center.
LICENSING INCOME PER YEAR
2004-2014

PATENTS PER YEAR
2004-2014
Technology Development Center Staff

Dr. Steven Price  
Associate Vice President for Technology Development  
Director of the Technology Development Center

Cindy Malayer  
Manager

Angela Cross  
Administrative Support Specialist II

Russell Hopper  
Senior Licensing Associate

Dr. Scott Davis  
Licensing Associate

Jai Rajendran  
Technology & Business Development Manager

Ann Roberson  
Staff Attorney—assigned to TDC from VPR office