



ARE GENETICS RESHAPING THE MARIJUANA INDUSTRY?

Mapping the cannabis genome with CJ Schwartz of Marigene

We spoke with CJ Schwartz the founder, CEO and CSO of Marigene to try to unravel the sequencing of roughly 30,000 genes that make up the genome of Cannabis. As patients, we marvel at cannabis' medicinal properties and often wonder how the plant makes THC. With 15 years of plant molecular genetic experience, Schwartz is more than qualified to piece together the puzzle. Schwartz has a BS in Genetics and Cell Biology from the University of Minnesota and a PhD in Biochemistry from the University of Wisconsin. He completed his post-doctoral research at the Salk Institute in San Diego, participating in plant natural genetic variation studies. Schwarz was a Howard Hughes Teaching Fellow and a Scientist at the University of Wisconsin, where he was involved with the development of dedicated bioenergy crops.

BLAZED: What is Marigene?

SCHWARTZ: Marigene is a company that identifies the genetic differences among cannabis strains and the genes responsible for these differences. Genetic differences are what cause different strains to have different effects. DNA allows reproducibility, consistency and transparency from your cannabis strains.

BLAZED: Why are you researching mapping the cannabis genome?

SCHWARTZ: The more information we gather about cannabis genetics, the more tools we have available to create tailored strains. As a plant, cannabis has a unique position in human society. It has proven medicinal effects. Cannabis is a targeted compound. It interacts with a very specific system in the human body, similar to insulin or hormones. In contrast, ethanol is toxic and is non-specific, and its effects are due to a poisoning of all of the cells in your body. Understanding the cannabis genome brings transparency, legitimacy and integrity to cannabis products, and allows us to better understand how chemicals from cannabis interact with the human brain.

BLAZED: How did you get involved in cannabis research?

SCHWARTZ: My interest in cannabis guided my research career. Cannabis may not be a cure-all, but it has significant and measurable medicinal effects for many patients.

Cannabis, as a plant mixture, will never fit into a large pharma-scheme as complex undefined mixtures are difficult to study in a traditional pharmaceutical company context. To allow true development of cannabis products, we need more science. Genetic identification can provide a method of certification to more completely describe plant material. Our genetic analysis is

required for normalization and acceptance of cannabis products, but also essential for future breeding efforts to develop better and more useful plants.

BLAZED: Why is this research so important?

SCHWARTZ: We can develop or stabilize a plant that produces a very specific chemical profile for a specific condition, such as seizures, nausea or pain. By breeding plants tailored to a patient's specific chemical profile, a patient can receive exactly the medicine that they need and minimize negative side effects.

The current term describing the interaction of cannabis chemicals is called the "entourage effect." Interactions among compounds can be additive (5+5=10) or synergistic (5x5=25). Entourage effects describe synergistic effects, where a small amount of compound A (for example, Myrcene) vastly increases the effects of compound B (for example, THC). Instead of flooding one's body with an excessive amount of chemicals to get a non-specific effect, Cannabis plants can be bred to produce a very specific effect. Sick people need better medicine.

BLAZED: What information do you hope to gain?

SCHWARTZ: Currently our goal is to catalog the natural genetic variation of cannabis, and to identify DNA changes that affect a trait of interest. Once superior variants of a gene are identified, those variants can be combined, by marker-assisted breeding, to produce new combinations of genes.

How different cannabis chemicals interact to produce a desired effect, and how different human genetics influence the efficacy of those chemicals is the ultimate goal of medical marijuana research.

/ DNA ALLOWS REPRODUCIBILITY, CONSISTENCY AND TRANSPARENCY FROM YOUR CANNABIS STRAINS. /





BLAZED: How will it help society?

Schwartz: First, scientific data is a prerequisite to public acceptance of cannabis as a legitimate medicine. If a cannabis-infused product helps a patient with pain, without causing side-effects like constipation, it helps society. If medicinal relevance is proven for cannabis, it counters the ignorance associated with the illegal status of this helpful plant.

BLAZED: Is this a collaborative effort?

Schwartz: Yes, we are working closely with academic institutions and chemical testing labs to gather data for establishing correlations between specific cannabis strains and desirable chemical profiles. Our closest collaborator, Dr. Nolan Kane at UC-Boulder, is working to complete the cannabis genomic sequence and generate the first high-resolution cannabis genetic map.

BLAZED: When are you expecting to complete your research?

Schwartz: Never! There is an ongoing need for product identification and strain improvement, and needs will change with time, requiring different and improved products. Humans still spend billions on corn research.

BLAZED: How far along are you in the process?

Schwartz: We are currently accepting samples and produce a report in two to three months. Yes, turnaround time is slow due to the technology. We get so much information that the time commitment is justified. 🌿

ARIZONA RENAISSANCE FESTIVAL

Saturdays and Sundays, February 6, 2016 through March 27, 2016

Every year a part of the East Valley is transformed into a 16th Century European Country Faire when the Arizona Renaissance Festival opens to the public. The Festival is a wonderful combination of amusement park, shows, comedy, music, feats of daring, street performers, shopping, and indulging. *East Highway 60, Gold Canyon. www.royalfaires.com/arizona*



INTERNATIONAL MOTORCYCLE SHOW

Saturday, February 20 and Sunday, February 21

Get your all access pass to the powersports world with hundreds of the hottest street bikes, dirt bikes, cruisers, scooters, side-by-sides and ATVs for both new and experienced riders. From the latest gear and aftermarket accessories to informative seminars and interactive entertainment, this thrilling event is the place to experience the latest in the world of motorcycling. *University of Phoenix Stadium. www.motorcycleshows.com*

BITES N' BREWS CRAFT BEER FESTIVAL

Saturday, February 27

A showcase of craft beers from Arizona and across North America. Fun includes outdoor games such as corn-hole, pong, life-size foosball and more. Compete for prizes including the coveted Bites 'n Brews Cup. *CityScape in Downtown Phoenix. www.fourpeaks.com or www.cityscapephoenix.com*

THE INTERNATIONAL SPORTSMEN'S EXPO & BOAT SHOW

Thursday, March 10 through Sunday, March 13

Arizona's largest sportsmen's show. At the International Sportsmen's Expo you'll find a diverse exhibition of outdoor products and services. Outdoor enthusiasts can attend expert-led seminars, try new products, and even test their skills. *WestWorld in North Scottsdale. www.sportsexpos.com*

