



## The Salvation of Doug

"I use this story in my introductory genetics classes to explain the rationale behind mutational analysis and to show younger students the basic differences between genetics and biochemistry."

- Bill Sullivan -

On a hill overlooking an automobile factory, lived Doug, a retired biochemist, and a retired geneticist (nobody knew his name). Every morning, over a cup of coffee, and every afternoon, over a glass of beer, they would discuss and argue over many issues and philosophical points. During their morning conversations, they would watch the employees entering the factory below to begin their workday. Some would be dressed in work clothes carrying a lunch pail, others, dressed in suits, would be carrying briefcases. Every afternoon, as they waited for the head on their beers to settle, they would see fully built automobiles being driven out of the other side of the factory.

Having spent a life in pursuit of higher learning, both were wholly unfamiliar with how cars worked. They decided that they would like to learn about the functioning of cars and having different scientific backgrounds they each took a very different approach. Doug immediately obtained 100 cars (he is a rich man, typical of most biochemists) and ground them up. He found that cars, consist of the following; 10% glass, 25% plastic, 60% steel, and 5% other materials that he cold not easily identify. He felt satisfied that he had learned of the types and proportions of material that made up each car.

His next task was to mix these fractions to see if he could reproduce some aspect of the automobile's function. As you can imagine, this proved daunting. Doug put in long hard hours between his morning coffee and afternoon beer.

The geneticist, not being inclined toward hard work (as is true form most geneticists) pursued a less strenuous (and less expensive) approach. One day, before his morning coffee, he hiked down the hill, selected a worker at random, and tied his hands. After coffee, while the biochemist zipped up his blue jump suit, adjusted his welder's goggles, and lit his blowtorch to begin another day of grinding,

the geneticist puttered around the house, made himself another pot of coffee, and browsed through the latest issue of Genetics.

That afternoon, while the automobiles were rolling off the assembly line, Doug, wet with the sweat of his day's exertions, took a sip of beer and as soon as he caught his breath began discussing his progress. "I have been focusing my efforts on a component I consistently find in the plastic fraction. It looks like this (he draws the shape of a steering wheel on the edge of a napkin). Presently I have been mixing it with the glass fraction to see if it has any activity. I am hoping that with the right mixture I may get motion, although I have not had any success so far. I believe with a bigger blow torch, perhaps even a flame thrower, I will get better results."

The geneticist was only half listening because his attention was drawn to the cars rolling off the assembly line. He noticed that they were missing the front and rear windows, but not the side windows. As soon as the biochemist finished speaking (geneticists are very polite conversationalists), the geneticists proclaimed, "I have learned two facts today. The worker whose hands I tied this morning is responsible for installing car windows and the installation of the side windows is a separate process from the installation of the front and back windows."

The following day the geneticist tied the hands of another worker. That afternoon he noticed that the cars were being produced without the plastic devices the biochemist was working on (steering wheels). In addition, he noticed that as the cars were being driven off to the parking lot, none of them make the first turn in the road they begin piling up on the lawn.

That evening, to Doug's dismay, the geneticist concluded that steering wheels were responsible for turning the car and, in addition, that he had identified the worker responsible for installing the steering wheels.

Emboldened by his successes, the next morning the geneticist tied the hands of an individual dressed in a suit and carrying a briefcase in one hand and a laser pointer in the other (he was a vice president). That evening the geneticist, and Doug (although he would not openly admit it), anxiously waited to see the effect on the cars. They speculated that the effect might be so great as to prevent the production of the cars entirely. To their surprise, however, that afternoon the cars rolled off the assembly line with no discernible effect.

The two scientists conversed late into the evening about the implications of this result. The geneticist, always having had a dislike for men in suits, concluded that the vice-president sat around drinking coffee all day (much like geneticists) and had no role in the production of the automobiles. Doug, however, held the view that there was more than one vice president so that if one was unable to perform, others could take over his duties.

The next morning Doug watched as the geneticist, in an attempt to resolve this issue, headed off towards the factory carrying a large rope to tie the hands of all the men in suits. Doug, after a slight hesitation, abandoned his goggles and blowtorch, and stumbled down the hill to join him.