The Alternative Line

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You, Too, Can Diagnose And Fix Things – Chapter One

Whether subsistence farmer or interplanetary traveler, it is nearly impossible to avoid problems entirely. Some are intractable, such as health related, over which you have no control, or weather/environment over which your control is at best severely limited. But most are problems which, with a little thinking, should be able to be understood, and resolved. Over many years I have had numerous people ask my opinion on automotive issues they have experienced, and I have started to wonder whether I have been missing an opportunity which has stared me in the face. Some recent questions from my daughter have led to an "aha moment" for me, and this is my preliminary response. Since I have always been a creative guy, solving problems has never been beyond my scope. Rather, I enjoy the challenge and the satisfaction of successfully resolving such issues. But I have somehow managed not to make an economically viable model from most of those, except where they were part of another defined project, rather than as an abstract idea in itself. So this is an attempt to re-address that, with a hope for better outcomes along those lines.

Diagnostics is not so much about being an expert in any system, as being aware of the fact that it is a system, and the logical implications which stem from that fact. Take a simple example; your car. It has a host of different functions which must occur in order for it to provide the value you expect from it. But very few of them are you aware of on a conscious level, unless and until they do NOT work as you expected them to. In fact, for most of life we are oblivious to the systems which occur around us. There are natural systems we take for granted, such as gravity, even as we depend upon them. Were we in orbit around the planet, gravity would still be working on us. But we might be unaware of it because we might be "weightless" due to the fact that we are being thrown outward by a balancing centripetal force which equals that gravity, because we are travelling at 17K miles per hour in that orbit.

So the fundamental tool needed for diagnostics is an ability to both look at WHAT is happening, as well as WHY can this happen. And when you become capable of doing so, you will recognize that much of diagnostics is the simple process of elimination of most of all those possibles by the "exclusionary" process – if all the facts of the circumstance are not compatible with that discrete possibility, it is highly unlikely to be contributory to the cause, so should be eliminated and you move to the next possibility.

One caveat which must be kept in mind, though, is that your failure to imagine a relationship does not exclude its real possibility. There was a PBS TV series called "Connections" with James Burke many years ago which traced seemingly unrelated technological occurrences throughout history to demonstrate the ultimate inevitability of certain facts. For example, the use of a device called a stirrup during the Battle of Hastings in 1066 led to the English empire, which begat us, the USA. Our religious "anti-establishment" which was in the form of the Puritans, was a genetic precursor for both our rebellious resentment of the control by that remote crown, and for the type of personality which would risk all to be a Gold Rush "49er", the same kind of trait found in the Silicon Valley. In fact, Ellis Island represents the embodiment of a "welcome mat" for precisely that kind of person, someone who would leave everything they knew for the chance of a better life in the unknown, based strictly on their own belief that they could impact that future. In many ways our current immigration policies seek to subdue precisely the traits which made this country the place sought by those "tired, poor huddled masses …" so eloquently welcomed by the Emma Lazarus sonnet "The New Colossus" on the Statue of Liberty which first greeted them on their arrival to New York Harbor. We are a nation predisposed genetically to think outside the box.

That thinking must be utilized in diagnostics – you must be able to conceive all possible ways that a circumstance could exist if you are to rationally sort between them to determine truly probable causality. Otherwise, you potentially overlook the real culprit. But that should not be seen as a reason anyone cannot be capable of being an excellent diagnostician. It is merely a new way of thinking which you must train yourself to use in approaching any problem. If you are a person who jumps at the first possibility which comes to mind, you will probably replace a lot of needless parts because you failed to ask the pertinent critical review questions which will show the distinctions between the facts available and those implicit from the idea you have just conceived. Those distinctions point you in the better direction, from which you better frame the resolution.

There is, however, a requirement that you look closely enough to be able to see the details those distinctions require. As a simple example; you have a headlight out. Clearly, you could look and see the other headlight on and presume to replace the bulb. But if you own a Porsche, you probably have at least a second fuse which can be involved, and fixing it is easier than changing that bulb in the case of new cars at least. But why might a fuse blow? And in any case, can you tell whether there is power at the fuse? What about at the bulb itself? And in the case of a headlight, is the high beam OK, or both beams bad? If both, that requires multiple failures, which have reduced statistical probabilities for each incremental added failure needed, so maybe you should look for a single failure mode which can be consistent for both, such as a bad ground. The key is to think critically, ie "what's wrong with this picture?"

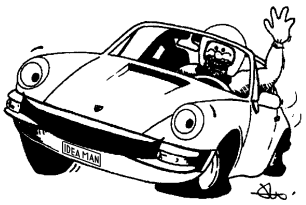
Anyway, in "Connections", James Burke noted that before the Renaissance, most everyone believed what the church taught – that everything revolved around the earth. He noted as well that by the time, sailors were well aware that the earth was round – they could see the curvature at sea. So some progress had been made on the "flat earth" front. But Mr. Burke made the salient observation that beliefs then were based on what we could observe, and that the terms "sunrise" and "sunset" were precisely what it looked like; the sun seemed to rise in the east and set in the west, and that it was only by detailed review of the paths of multiple heavenly bodies seeming to have paths which made no sense that one had any reason to question that earth-centric model. And that it was only in trying to find a better explanation for those odd paths that we could determine what we now know to be truth; that the earth and all the other solar system planets travel around the sun, making an "earthrise" and "earthset" more accurate descriptors of fact.

Imagine, then, the wonderment which must have befallen people when Albert Einstein declared Isaac Newton's gravity to be wrong, with his description of the "bending of space-time". And even more so to have Einstein be proven correct (so far ;-) by a celestial observation during a solar eclipse of the bending of light from a distant star whose light passed close to the sun during that eclipse. I must freely admit, though, that while I know of both those facts, I am at a loss to explain WHY Einstein was able both to recognize the distinction and to predict the specific deflection which would be observed by the British scientist who made the eclipse observation, done during WWI while Great Britain was at war with Einstein's country, Germany. Talk about being politically incorrect. But that goes to the heart of diagnostics – you must be ruthlessly honest with fact, even when it seems to contradict your preconceptions.

Another requirement for diagnostics is information. Merely by looking at a bunch of wires is of little help in trying to determine where a fault might lie, unless the specific suspect wire is obviously burned or in some other way damaged which is directly observable. Those do occur, but they are relative rarities in the grand scheme. Murphy's Law dictates that the burned wire will be within the bundle, and that you must damage three other good connections merely to look at the bad one. The information of which I write is typically documentation. For circuits that should be a wiring diagram. For mechanisms, that should be at least a picture of the mechanism as it is supposed to be, and a description of what it is supposed to do. And so forth. The more and better documentation for what is supposed to be correct is invaluable in trying to find what is not.

This being the real world, however, that is often not a possibility. Few people carry in their cars the library of repair manuals they may have at home. But the car rarely breaks there. In that case, knowing how to access information by other means can be a godsend. But this treatise is intended to give you a path for when those "ideal" situations are not available, and you must drop back a few yards and punt metaphorically. A "press on regardless" mentality means you find solutions from what you have available. But you improve the odds by preparation. Clearly, you could conceivably carry an oscilloscope which might allow you to debug at a chip level, but few people would have a clue how to use one and they are cumbersome, costly, and fragile – not a good mix for "carrying around". At the same time, electronic diagnostics may be helped by such a device, but electronics are quite reliable - once you get past the 100th hour of their usage, they are usually good for the next ten million. Most electronic failures, not caused by some other component forcing them to overload, will usually be their interface elements, and those are often small mechanical relays which fail in a mechanical way. One example I wrote about with my Strange Rover was the inability to start when the temperature dropped below freezing. That was key, since freezing moisture causes water to become rigid, and that prevented the mechanical contactor from moving within the relay which was subjected to that moisture. The fix was to duplicate the function in an area which would not be subject to the problem. That entailed essentially splicing into the original relay circuit to duplicate all the conductors to and from the suspect relay, run to a duplicate thereof kept in a known dry location. Since the original relays (2 in that case) provided for each of fuel pump and fuel injectors separately, one relay was adequate to "backup" those two since they logically were energized at the same time in all cases anyway, and that addition provided a remarkable triple protection for the function, since by splicing in a single new relay, each of the other two was functionally also duplicative. And since no "not energized" circuit existed for either, there could be no problem if as many as any two of the three failed to switch properly – they would simply do nothing in that case, while the remaining one would take all the load. Especially for cars like the Strange Rover with its suspect Lucas Electrics (Joseph Lucas, Prince of Darkness ;-), such duplicative circuits have actually made it extremely reliable now. I checked all with a $1.99 VOM. You should have one in each car.

I will be working on subsequent chapters, but it is now your turn to step up. I could go in the direction of a book, which is how I envision this. Or, it has been suggested that I start a blog. I am unsure how to make that a commercial success. So how about those of you who have such insights, please contact me directly at ideaman.jch@gmail.com or through Skip with your "vote" and ideas for turning this diagnostic instruction help into a supportive business. That will benefit us all. Thanks.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