

# Interview with science advisor Dr. Kevin Grazier, Exclusive to Caprica City.de

Contributed by Peter Glotz, caprica-city.de  
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Kevin Grazier, doctor of physics, is both working at the NASA Jet Propulsion Laboratory and as a scientific advisor for Sci Fi's original series "Battlestar Galactica" and "Eureka". For Richard Hatch's continuation trailer "The Second Coming", he wore a centurion costume. And one of Grazier's presentations - on the issue of navigating in space - evolved into the season 3 episode "The Passage".

In an exclusive interview with Caprica City, the American talked about his life as a scientist, his activities in the sci-fi fandom and the realism of TV shows.

**Caprica City:** Please let us start by telling something about yourself. Where are you from? And where do you live? What makes you want to become a scientist? Where did you study and when did you get your doctor title? In what?

**Kevin Grazier:** Wow, such open-ended questions. Are you sure you want to give me carte blanche to talk about myself? I grew up just north of Detroit, Michigan, did my undergraduate degree and Masters Degree at Purdue University in Indiana, then moved to Los Angeles to do my doctorate work in planetary physics at the University of California., Los Angeles (UCLA). My dissertation title was (are you ready for this?): The Stability of Planetesimal Niches in the Outer Solar System: A Numerical Investigation.

Presently I live in Sylmar, California, in the San Fernando Valley, at the base of the San Gabriel Mountains.

As far as what made me want to become a scientist, I think if you ask most scientists what got them interested in science, irrespective of discipline, you'll overwhelmingly get two responses: space and dinosaurs. In my case I was interested in both as a child, but just never gave up the interest in space. Therefore early on I set my career and educational goals such that I would be ideally suited for a career in the space program.

The jobs in television came much later (and yest that really is my office at the Jet Propulsion Laboratory).

**CC:** I heard that in your spare time, you do scuba diving and martial arts. Not quite the hobbies one would expect from a scientist. What kind of martial arts? And where are you going to dive?

**KG:** I do enjoy those kinds of activities in my spare time. I think there is a stereotype of scientists as nerdy folks who spend most of their time reading --when they're not in the laboratory or sitting behind a computer. It's been my experience that most scientist are very well-rounded and have quite varied interests, so that I SCUBA dive or practice martial arts shouldn't be surprising - especially SCUBA diving. I work in the space program, and I'm an explorer for a living. Is it any surprise, then, that I explore in my free time as well? Normally I dive off Southern California, but I plan on diving in Florida in December and Hawaii in January.

For years I practiced a form of martial arts called Koei-Kan Karate. I've not been as active doing that in the past few years, but when I do start again, I will likely do Wing Chun Kung Fu.

Now if you really want to talk about an activity that is counter-intuitive for a scientist to enjoy...In the Los Angeles area, at the Fullerton Airport, there is a company called "Air Combat USA". You arrive early in the morning, are fitted for a flight suit and helmet, then are given a two-hour lecture on the fundamentals of air combat, or dogfighting. Then they take you out to the aircraft, there is a pilot on the fight hand side. These pilots are usually former military pilots, or current military pilots on leave for the weekend. The pilot's job is to get the plane off the ground, to get you out over the ocean, then to land the plane at the end. Once the pilot gets the aircraft over the ocean, he turns over the stick to you, and in 60 minutes you do six simulated dogfights. A JPL co-worker did that with me for my birthday a couple years back.

I think the stereotype of scientist that we see on TV, and in the movies, needs to be revised! By the way, in our six dogfights, I won three and my friend Jon won three - but I won the first one, which is the one that really matters.

**CC:** I would presume that most of the "serious" scientists would laugh at science fiction shows. What was the reaction from your colleagues at NASA or at the college where you teach astronomy as they learned that you work for such shows?

**KG:** You're suggesting, then that I'm not a "serious" scientist because I work in science fiction? Actually, many of the scientists with whom I work love science fiction! You saw the Cylon poster in my office, here a few pictures taken around other Cassini offices: [picture 1](#), [picture 2](#), [picture 3](#)

Just because we're scientists, even serious scientists, doesn't mean we don't like a little escapism in our spare time. Now if you asked if my fellow scientists teased me when they saw something technical in "Galactica" with which they don't agree...well that's a different matter entirely.

**CC:** I heard that you are an advisor for a whole bunch of shows. What shows do you work for? Do you watch all those shows yourself? And if so, do you enjoy watching them or is it part of your job?

**KG:** I presently am working on four TV series. I work on a kids' animated/educational TV show called "The Sula Patrol", and we're currently working on our third season. I am also the science advisor, as you know, for "Battlestar Galactica", and we are just finishing up season three. I do the same job on the new Sci Fi Channel series "Eureka". I'm happy to report that we just started working on season two!

I don't get to see "Zula Patrol" very often, simply because it's on during the day while I work at JPL. I don't miss an episode of "Eureka" or "Battlestar Galactica". I would watch either of these shows even if I didn't work on them. I am also fortunate because, although I do receive several drafts of the scripts for the episodes, the final version is still often quite different than the last script revision I see. IN other works, the episodes that make it to TV often still have surprises for me.

The forth TV show on which I work doesn't even have a title yet, so I don't know how much I should say about it.

**CC:** And, speaking of shows, which shows do you watch? Do you prefer those shows which take science serious or do you enjoy unrealistic shows just as much?

**KG:** I work full-time in the space program, teach college astronomy courses, and work on different TV shows. Who has time for television? Actually, I do go out of my way to watch both "Eureka" and "Battlestar Galactica", as I said. I watch both "Stargate SG-1" and "Atlantis". I am also a huge fan of the series "24". The "Stargate" series and "24" provide an escape - where I don't know the ending like I do with "Galactica" and "Eureka".

While I certainly appreciate shows that make every attempt to be realistic, I do enjoy "unrealistic" shows as well - as long as they aren't trying to appear as if they are, in fact, realistic. A good example here, at least in my opinion, would be the movie "Armageddon" (and we'll talk more about this a bit later). The movie took itself so seriously, but the science was so bad!

**CC:** You seem to enjoy visiting conventions. So you talk to lots of fans? What was your impression of the fandom?

**KG:** I love visiting conventions, and enjoy chatting with fans! It wasn't that long ago that I was a "mere" fan myself:

OK, let me provide you with a little history here. Before graduate school, I used to attend two or three conventions a year. Back in the mid-1980's I helped form a Doctor Who fan club in Detroit, Michigan called the Motor City TARDIS.

Interestingly, my being active in sci-fi fandom was what put me on the path to working on "Galactica" eventually. A college friend and I were at a convention in Columbus, Ohio in 1984. At that convention they had a skit (short

play) competition - several groups did brief skits, and a panel of judges determined a "winner". I was standing there with my friend Ges, and when he and I saw which group was name the "winner" we both sneered, turned to each other and said simultaneously, "We can do better." Over the next several years, our fan club entered several such skit competitions and never lost.

I moved from the Midwest to attend graduate school in Los Angeles. While I was a graduate student at UCLA, my friend Ges (again) and I were discussing the series "Star Trek: Voyager". Not entirely happy with the first two seasons, we decided to try our hands at writing an episode. Back then "Star Trek" was one of the few series that accepted unsolicited manuscripts - in other works, writers not represented by an agent could submit scripts to "Star Trek". The Trek producers openly admitted that they received about 3000 scripts a year, and that the probability of a good outcome for your script was not high. The only thing they promised was that your script would be read, and that you would hear back from them - likely in eight weeks to eight months.

Seven months, to the day, after submitting our script, we received a phone call from the "Voyager" production office at Paramount. The Executive Producer's assistant said that they loved our script, although it went in a dramatic direction they were not prepared to go. So we were invited to develop stories, come to Paramount, and "pitch" them to a staff writer. I recall asking, "Is this something that happens only once, or can we come back again?" She said, "Oh, you can come back, as long as you're not arrogant, rude, or an idiot."

I pitched several times to "Voyager", and in the process met Bryan Fuller (of "Dead Like Me", "Wonderfalls", and "Heroes" fame) and Michael Taylor (also known for "The Dead Zone"). I kept in contact with Bryan over the years and when "Galactica" was green lighted, he "pitched" me to fellow Trek alumni Ron Moore one day at lunch.

A few days later, after I had already met Ron and was hired as the new "Battlestar Galactica" science advisor, Richard Hatch was in Ron's office discussing his role as Tom Zarek. By that point I had been friends with Richard for 5-6 years. As he was leaving, Richard mentioned, "Oh, and if you're looking for a science advisor, I know this guy..." Ron stopped him, "Oh, we've already been talking to somebody" It turns out they were referring to the same person: me.

There is another irony here as well. Michael Taylor, to whom I pitched stories on "Voyager", just joined the writing staff of "Galactica" for season three. Michael wrote what I think is the best episode of "Star Trek" ever, from all the various series: a "Deep Space Nine" episode called "The Visitor". He also wrote another one of my favorite DS9 stories called "By the Pale Moonlight". He will make an outstanding addition to the show!

Because the "Eureka" writers and the "Galactica" writers are located in the same building at Universal, "Eureka" was made aware of my existence by word-of-mouth.

Amazing how that all worked out, isn't it? All of this started from doing silly little plays at science fiction conventions. Now I'm working on two excellent sci-fi series and actually getting paid for it. Not only that, but gotten several invitations to appear at conventions as a guest. I attend as many as I can because, I love chatting with fellow fans.

**CC:** I read that you called Stargate an unrealistic show at Comic Con. Why is that? What about other genre hits like "Star Trek", "Babylon 5", "Eureka" or (of course) BSG? What would you say is the most realistic show on TV? And how realistic can a sci-fi show become without being boring?

**KG:** First, I'm glad to set the record straight regarding what I said about "Stargate", although I'm surprised that you heard about my off-handed comment. On second thought, no I'm not. One thing I've found in going to conventions is that everything you say on a panel discussion is written down and ends up in somebody's blog somewhere. If you're really unlucky, it ends up on the Wikipedia.

Have you ever thought one word, but when it comes time to speak a different word comes out? That's pretty much what happened at San Diego Comic Con. The question I was asked was (approximately), "Are there any shows on TV where the science is so bad you can't watch?" What I was thinking was, "Have you ever seen 'Armageddon'?" I know it's a movie, not a TV series, but to me it is the epitome of bad science in a science fiction movie. I have discussed my opinion of "Armageddon" with Richard Hatch, who was sitting next to me on that very same panel discussion, several times.

Although in mind I thought "Have you ever seen 'Armageddon'", what I said was, "Have you ever seen 'Stargate'?" The crowd did a very big, "Ooohhh!", as if I'd said something scandalous. I didn't even realize what I'd said until Richard turned to me with an expression that said, "I don't believe you said that".

A moment passed before I realized what I had, in fact, said. Although I sat there still calmly smiling, in my mind I was thinking, "Holy Frak! I just 'dissed' another Sci Fi Channel series. I am so going to be fired!"

Since the crowd reaction was so ...loud... I figured I had a choice. I could recant and say "Oh, I meant 'Armageddon' or I could explain my comment. That's where I made the second mistake and said, "Don't get me wrong, I love 'Stargate', and I'm a huge fang, but I get about one cringe per episode." While that's sometimes true (the episode that aired the Friday before Comic-Con had one such moment), that comment wasn't really what I intended to say, and I totally embarrassed myself. I was convinced somebody from the Sci Fi Channel was going to walk up to me immediately after the panel and say, "Dr. Grazier, your services on 'Battlestar Galactica' will no longer be required."

So, yes, I frakked up. Have I learned to think before I speak in that type of situation? You bet I have!

**CC:** Please tell us something about your work at BSG. How does it work? Do they just call you if they have a special question or do they send every script to you for revisions?

**KG:** You just touched on both ways I work on Galactica scripts. Some of the writers, in particular Bradley Thompson and David Weddle, call me when they first start writing a script - to incorporate the science as best as possible from the onset. Since "Battlestar Galactica" is not a tech-heavy show, though, most stories are character-based, and do not require my input from the beginning.

So I do get copies of every story, and send in technical notes (usually just the first few drafts, because by then I've made all the comments I'm going to make). Since I have a little bit of a military background, I also often make military comments as well. If the writer simply wants me to provide a term, or to check a particular block of text for accuracy, they simply write [TECH] in the script, and I know that my input is required there.

**CC:** Do the writers of BSG know what they're doing? Do they have scientific knowledge or do they have your mobile number on speed dial? How much do you have to change?

**KG:** "Battlestar Galactica" won the prestigious George Foster Peabody Award for excellence in broadcast media. I certainly think that this shows they know what they're doing!

I think you were asking, though, about their level of technical expertise? It varies. That doesn't matter, though. They have me. Since "Galactica" is a character-driven show, I rarely have to change much.

Your comment about speed dial is funny, though. I was at Dragon Con in Atlanta, and had just finished a panel discussion, when my phone rang. It was Bradley Thompson with technical questions for a season three episode. Not only did he know I was in Atlanta, he knew that I had just finished with my panel - he said, "No matter where you are, if we have questions, we will find you."

**CC:** How much influence do you actually have? What if a writer comes up with something absolutely ridiculous but it's important for the story? Was there a moment in the show where they did something against your advice?

**KG:** So far, to the best of my memory, none of the writers have come up with something totally ridiculous. If a writer did come up with something ridiculous but important, I'd suggest a modification that's better scientifically, but still serves the same dramatic purpose.

As for how much influence I have, that entirely depends upon who wrote the script. Some writers are more hesitant to make changes than others. The word "advisor" comes from the same root as "advice", and they don't have to take everything I say. So although they've done things against my advice, in bould I think we do a pretty good job of getting things right.

**CC:** Did it ever happen that a colleague watched the show and showed you an error? Have you ever been wrong?

**KG:** Have I ever been wrong? Me? Wrong? Are you serious? O course I've never been wrong. I laugh in the face of "wrongness", Hahahahaha! See, that was me laughing!

OK, well, there was that one time...

The biggest mistake I feel I've made in the show was not so much an error as it was an omission. In the second episode of season one (over two years ago when I was only a baby science advisor), I missed an obvious application of a very basic physical law. In the episode "Water", the explosions in Galactica's water storage tanks occur in the opposite direction, and would probably snap the connection between the two vessels. When I realized this, I called the "Galactica" Production Office, but was too late and was told, "That ship has already sailed."

A few weeks ago my boss at JPL actually pointed out what he thought was an error in the third season episode "Collaborators". We discussed it and, well, let's say that we agreed to disagree.

**CC:** And now some questions from our readers. Please excuse if you already answered them on your Tech Blogs.

We know that Galactica uses bullets instead of laser guns. But how are those projectiles launched? Do they use explosives like the bullets in today's guns or do they use magnetic catapults (rail guns)?

**KG:** We establish in episode 12 of season two that rounds fired by the Vipers are similar to rounds fired by modern tactical aircraft: an explosive charge propels a dense projectile (very likely made of lead or depleted uranium). The rounds fired by Galactica herself may be launched by explosive charges, or they may be rail guns (I prefer to think the latter), but I'm not sure. Ron hasn't told me which yet.

**CC:** You said you won't talk about how the FTL drive works because that could become part of the story once. But in general, do you think FTL is possible? What do you think is the most likely way to travel through the universe? Wormholes? Strings? Subspace? Or something completely different?

**KG:** You are correct regarding the FTL drive. For an episode of season two ("The Captain's Hand") we needed to know the basic principles on which the FTL drive worked. After pacing a hotel room in Vancouver for nearly 4 hours, I came up with something I really liked. Although I have discussed the operation of the FTL drive with some of the writing staff, and have submitted notes on the topic, I won't discuss something like this openly if it could eventually become a plot point. Sorry.

As to the question of whether or not FTL is possible. I don't know. I'd like to think so.

**CC:** Why does Galactica have to retract the pods before she can do an FTL jump? Why not the Pegasus or the other ships in the fleet?

**KG:** The other ships in the fleet don't retract their pods because they don't have any; Galactica (usually) retracts the pods because Ron said so and it looks cool.

**CC:** In the novelization of the Miniseries, there's something called "Lorey field gravity". How do they explain the artificial gravity aboard Galactica? Or has there never been a discussion about that, and we just have to accept the fact that they don't float around?

**KG:** I read a lot of scripts these days, but little else. I haven't read the novelization of the Miniseries, so I can't comment on that. As far as the artificial gravity on Galactica, I have discussed it with a couple of the writers, and for now let's just say that I feel it's based upon the same technology/science as the FTL drive.

**CC:** Given a very effective recycling system, what would be a realistic time span for the rag tag fleet to survive without external sources of food, water and fuel?

**KG:** Recycling doesn't last forever - eventually the second law of thermodynamics rears its ugly head and entropy creeps into the system. I expect that resources, or the lack thereof, will be an ongoing concern for the Rag Tag Fleet. What is not an uncommon molecule from a universal abundance standpoint, but other things - like fuel and food and even things you may not even have thought of yet - may be more difficult to replenish.

**CC:** And one last thing: Did you watch the old "Battlestar Galactica"? What's your opinion of this show, as a viewer and/or a scientist?

**KG:** I did watch the original "Battlestar Galactica", and really enjoyed it when it first came out. I never missed an episode. Even back then, however, I recognized that they needed a technical advisor on staff. There were so many technical errors in that series that could have been fixed without sacrificing dramatic content.

The first example that comes to mind is the fact that, in the original three-hour miniseries, they confused the terms "planetary system", "galaxy", and "universe" often using these terms as synonymous. Alluding to a previous question you'd asked, the original "Galactica" was a show that I watched, and enjoyed. It was fun, but I knew at the time it wasn't very accurate.

There is one application of basic physics I really wanted to see in the original series. Remember that cart that the Colonial Warriors stood in while being transported to their Vipers? I always wanted it to stop suddenly to enjoy the subsequent application of the conservation of momentum (rephrased: the cart stops, the Viper pilots do not).

**CC:** Thank you very much for taking the time. The German fans and the team of Caprica City really appreciate it. Please carry on with your excellent work on the show. It's a pity that the German Pegasus convention was cancelled.

**KG:** It's been a pleasure, and thank you for your compliment. Sadly, the Pegasus 2006 Convention was cancelled, and I was so looking forward to attending! Perhaps another convention in Germany will find me interesting enough to invite me as a guest.