

# The Science Behind Galahad

## Volume 1: Artificial Intelligence



Hi. **Dom Testa** here. You've got your eyes trained on the first entry in a brand new series of articles that I'm writing, and I'm excited about it.

You see, as I've spent the past few years writing the **Galahad** book series—which is about the ongoing adventures of 251 teenagers who live aboard a spaceship destined for another world – I've found myself increasingly interested in the *science* that is at the heart of what is technically science fiction. I wonder: How does artificial gravity work? What is the technology that allows Gap Lee to be such a good Airboarder? How does NASA make use of solar sails in space travel, and what *really* happens when the Earth passes through the tail of a comet? And when I deliver presentations at schools or talk with fans out on the road, I've found that they often wonder the very same things.



So, in an effort to satisfy my curiosity and yours, I've decided to explore some of those topics in greater detail. With each volume I'll tackle a scientific phenomenon of some sort and take it apart, bit by bit, until we all understand it a little better. It's the science behind the Galahad series, and I've got a sneaking suspicion that it's going to be a whole lot of fun. Let's dive right in, shall we? First up: Artificial Intelligence.

### “Open the Pod Bay Doors, HAL”

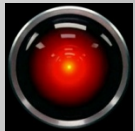
The term ‘Artificial Intelligence’, or ‘AI’ for short, dates way back to 1956, and the man who has long been credited with dreaming up that nifty little phrase is a computer scientist named John McCarthy – still alive and kicking as I write these words, by the way. Good for him. Anyway, the most basic technical definition that I've found is this:

#### *Artificial Intelligence*

*-noun; the capacity of a computer to perform operations analogous to learning and decision-making in humans*

Or to boil it down even further: computers who think and reason like humans. Hmm.

The first time that I remember being introduced to the concept of AI was in Stanley Kubrick's brilliant movie, and the Arthur C. Clarke book that accompanied it, *2001: A Space Odyssey*. It was produced so long ago (1968) that the year 2001 must have seemed impossibly far away. In *2001*, a spaceship sent to investigate one of Jupiter's moons is controlled by the **HAL 9000** (known simply as ‘HAL’), a computer that talks and thinks and maintains all of the ship's vital functions. Incidentally, four decades later a much cooler computer would appear aboard a much cooler ship and serve much the same purpose – but more on that later.



*2001* wasn't the first time someone had dreamed up this idea of a sentient computer – in fact, Clarke himself had been writing stories about such things since the 1940s – but it was the first time that the idea showed up on my radar, and I'll bet I'm not alone. That movie left an indelible impression on generations of filmgoers as HAL developed an agenda of his own and then executed it, all the while explaining his actions in a very calm, very creepy monotone voice.

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Also in the late 1960s, the television show *Lost in Space* featured a robot – aptly named ‘**Robot**’ – that displayed its own form of artificial intelligence (and which also contributed the phrase, “Danger, Will Robinson!” to pop culture history). It was the very definition of cheesy TV, but I loved that show. Later, in the 1980s, the film *Blade Runner* – also based on a famous science fiction story, this time by eccentric author Phillip K. Dick – featured cyborgs that had gotten out of control and gone on a killing spree. It was a blockbuster hit with big movie stars and dazzling special effects that became something of a cult favorite over the years. And to some degree, there are lots of books and movies with similar themes dotting our cultural landscape. *The Terminator* and *Star Wars* franchises both feature a heavy dose of out-of-control androids or cyborgs, as does *The Matrix* trilogy. Some even argue that *Frankenstein*, written in 1831, deals with issues of Artificial intelligence in its story of a monster created from spare parts in a madman’s laboratory. But is that all there is to the idea of Artificial Intelligence? Fictional computers run amok and bent on overtaking their human counterparts?



Hardly. Fact is, the real world of AI is just as spectacular – but much less menacing.

### A (Very) Short History Lesson

Once the field of Artificial Intelligence began to take shape, it wasn’t long before scientists from all over the world were raising the bar – and raising the stakes. The **U.S. Department of Defense**, which oversees the military, directed millions of dollars toward funding research, and other countries followed suit. Optimism ran high that within the span of a few decades, machines would possess the ability to cognitively perform many of the same tasks that humans do, and perhaps more. The train of innovation charged ahead...



...right into a brick wall. By the 1970s, the progress that was being made in the field of AI was not up to par with the lofty expectations that had been set for it, and some countries, including the United States, cut most of their funding for AI-related projects. This became known as the first (but not the last) ‘AI Winter,’ where the money dried up and the momentum largely stalled. This would happen again in the late ‘80s, but new developments once again reenergized the world’s imagination and the train started moving again.

It seems there are just too many possibilities for the field of Artificial Intelligence to stay buried for long... especially in light of the technological revolution that has taken place in the first part of the 21<sup>st</sup> century. In a world of satellites and digitization and quantum physics and nanotechnology, we’re bound to explore the boundaries of computer capabilities.

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### Some Cool Applications

Though we may not realize it, Artificial Intelligence *does* exist in today's world in various forms. We encounter it in a number of ways, some of which we don't even notice. But one of the most high-profile displays of AI technology in recent memory actually turned up in a distinctly old-world venue: the game of chess.



Beginning in 1989, Russian chess champion Garry Kasparov engaged in a series of matches against chess-playing computers designed by IBM. Perhaps the most famous match took place in 1997, when Kasparov was defeated by a computer called **Deep Blue** in a controversial six-game match. Kasparov would later avenge the loss in a series of rematches, but the lesson was clear: Deep Blue and the machines that followed in its footsteps clearly demonstrated an advanced capacity for creative and critical thought – something which many doubters had long claimed was impossible.

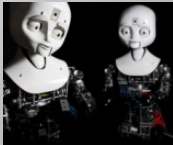


The years since Deep Blue's emergence have brought other major developments in the field of Artificial Intelligence. To one degree or another, computers now have the ability to do everything from diagnosing serious medical conditions to **composing original music** (both pop and classical, in case you were wondering). More often than we realize, a branch of AI is responsible for the backbone of some new technology that quickly becomes a fixture in our everyday lives. Take a quick look at all the gadgets in your home. I'll bet you can find at least a few that rely on AI, right?

Then there are the **robots**.



Ah yes, the robots. Every so often I will come across a news story that shows video of a robot designed by a brilliant team of scientists in some far-away lab – Stanford and the **Massachusetts Institute of Technology (MIT)** have each made great strides here in the U.S., but there are many similar projects going on overseas, particularly in Asia – and I always shake my head in awe and admiration. These robots can follow commands but, so far, have trouble thinking on their own. That's because no one has quite cracked the code for how to get them to process thoughts beyond the formal logic of, say, a Google search or a chess match. In those instances, a computer can sift through web sites or analyze probability based on previous chess moves, and it does it quite well. Far better than humans, in fact. But what computers still cannot do is connect that formal logic to abstract concepts, which is why, if a robot were to beat you in chess, it may be able to shake your hand afterward, but it would not be able to adjust if you wanted to high-five instead – not without being programmed to do so – nor would it understand the reason or the meaning behind your gesture.



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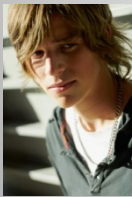
Of course this doesn't mean that there is not a great deal of practical use for artificial intelligence today. Indeed, some form of AI is already being used for everything from building cars to **programming your TV**. And more importantly, there is nearly constant daily progress. When you stop and think about it, we've come an awfully long way in a very, very short amount of time. I wonder what tomorrow might bring.

### Looking Ahead



It is true that many people fear what the future holds. (It's also true that people fear robots who look too much like real people – it's a lot like the way people fear clowns. Excuse me while I shiver away the goose bumps that suddenly appeared on my arms and neck.) Ever since **John McCarthy** and his peers first coined the phrase 'Artificial Intelligence' there have been those who oppose its development on the grounds that we, as humans, may be getting in over our heads. That we may one day create a computer that we will not be able to control. That we are destined to find ourselves the servants instead of the masters. And while it is impossible to say whether that eventuality comes to pass or not, what *has* become clear is that when it comes to Artificial Intelligence, the sky really is the limit. Which is why, when it came time for me to send 251 of the brightest teenagers from all over the world into space in order to save mankind, the person I put at the center of their experience wasn't really a person at all.

The narrator of the Galahad series, and the one who maintains many of the ship's vital functions, is a thinking, talking computer called Roc. Roc was designed in the image of his creator, Roy Orzini, but he also flashes a personality that is very much his own. He's sarcastic and wise, and he has a sense of humor, too. He develops relationships with crew members that go beyond the formal, professional capacity that you'd expect. Triana Martell is the Council Leader of Galahad, and there's no question that she is the star of the show. Other characters come and go, and I've found when I visit with fans of the book series, they each have their own **favorite character**.



But if those characters are the pieces that make up the Galahad series, then Roc is the glue that holds those pieces together. He's responsible for so much of the technical aspects of their journey – everything from regulating the oxygen, to maintaining the radiation shield, to preventing a catastrophic collision with an asteroid – but he also uses his advanced powers of deduction on a personal level. He's a confidant, a mentor, a friend. He's a computer who fits the very definition of

Artificial Intelligence, and then, when you least expect it, he is so much more.



Will science ever take that next leap in the development of computers? Might our children one day have a best friend who was designed and constructed in a warehouse somewhere? Or, as some claim, is there an essential part of the human experience that can never be replicated?

I don't know the answers to those questions any more than you do, but I'll tell you this: like just about everything else in the world of science, I *can't wait* to find out.

