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Team #4
2001: A Space Odyssey
Arthur C. Clarke
1968

Arthur C. Clarke is not only a world famous science fiction author, but has contributions branching into other arts and sciences as well. Born in Minehead, Somerset, England on December 16, 1917, Clarke, like many other men in England, was forced into World War II joining the RAF as a radar officer. This experience as a radar officer would lead to his only non-science fiction novel, *Glide Path*. Clarke published a technical paper entitled “Extra-terrestrial Relays” in the magazine *Wireless World* during 1945 which outlined the principles of satellite communication using geostationary orbiting satellites. This paper would set the groundwork of satellite communication realized about twenty-five years after the paper being published. Since 1945, Clarke has published more than seventy books, articles, and papers including the four books in the “space odyssey” series. *2001: A Space Odyssey* began as a movie script co-written by Stanley Kubrick and nominated for an Oscar in 1968. Continuing his entertainment career by working with Peter Hyams on the movie sequel to 2001, Clarke has also created a few TV series and worked with Walter Cronkite and Wally Schirra covering the Apollo 12 and 15 missions. Clarke’s lifetime work has been acknowledged with Knighthood in 2000.

2001: A Space Odyssey is a story of intelligence. A technologically advanced civilization has departed from their home world in search of further intelligent beings throughout the cosmos. On their journey, this civilization has encountered numerous planets teeming with primitive life. This advanced civilization is not traveling the cosmos for nothing, with each of these planets passed, a monolith is left behind. The monolith is a testament to their knowledge and technological power. The monolith is a teaching machine. The primitive man-apes here on Earth were taught the skills necessary to survive in a world full of danger through subconscious brain manipulation and repetition. The protagonist of the first part of this book, Moon-Watcher, is a leader of one of the many man-ape groups. Moon-Watcher was one of the more fortunate man-apes, in that he was able to benefit from the monolith in a larger way than most other man-apes. Accuracy and adaptation were in Moon-Watcher’s favor. The skills that the monolith

bestowed on the man-apes did not guarantee a safe passage through the ages, the fundamentals were there, but the man-apes would still need to brave the environment to survive.

Fortunately for us, the man-apes did learn and were able to adapt and survive through the ages. The story picks up again thousands of years from the time of the man-apes. It had been thousands of years since the monolith had departed from Earth after the education of the man-apes and the human race was now entering into the third generation of the space age. Dr. Heywood Floyd was making a special trip to the Clavius moon base to investigate the Tycho Magnetic Anomaly-One, or TMA-1. Dr. Floyd was no amateur when it comes to space travel; he is a veteran of one Mars visit, three moon visits, and an uncountable number of trips to the (international) Space Station One. The TMA-1 was discovered when a crew was doing a magnetic survey of the moon's surface and a giant jump in magnetic intensity on one spot of the map marked the location of this "anomaly." Dr. Floyd had arrived just in time for the TMA-1 excavation site to be bathed in sunlight. This was a key time, because just as the sunlight came into contact with the excavated monolith, an ear-piercing radio signal was emitted in a short pulse from the monolith. This radio signal would then cause a disturbance to ripple across the Solar System that would be picked up by the numerous observation satellites and relayed back to Earth.

That disturbance was traced back to a moon of Saturn, and quite soon after that discovery, this space ship *Discovery* had a mission profile change. No longer was *Discovery* going to survey planet Jupiter, but use Jupiter's gravitational pull to sling-shot the ship out towards Saturn. David Bowman and Frank Poole led the additional three man survey team on their trip to Saturn. Being the officers of the ship, Bowman and Poole would be required to remain awake and maintain the ship as the survey team rest in Hibernaculum. Maintaining the ship is really no more than doing redundant checks and learning as much as possible about Saturn and its moons. The ship was actually being controlled by a Hal 9000 computer system. Hal, or *Heuristically* programmed *AL*gorithmic computer, evolved from the "third" computer breakthrough, artificial intelligence. But, Hal knew something that the two captains did not: the true nature of the journey. Bowman and Poole saw this as just a survey mission to the outer planets, but Hal, and the sleeping "survey" team, knew better. This trip would be to land on *Japetus*, a moon of Saturn, and investigate the source of the disturbance.

Hiding this knowledge from his crewmates drove Hal to his breaking points. Hal understood the importance of the mission and took it upon himself to see to it that the mission went through to completion. Unfortunately, Hal had decided that he alone would be needed to complete the mission, and that the other crew members were not only expendable, but would get in the way. Frank Poole was deliberately murdered by Hal while on a bogus expenditure to “fix” the communication link with Earth, which Hal himself had deactivated. Bowman, aware of Hal’s trouble, requested that he be allowed to awake the remaining crew members. Unable to persuade him otherwise, Hal “allowed” the recovery of the sleeping men and while Bowman was distracted, Hal opened the ships docking bays to create a vacuum inside the ship and suffocate Bowman. Hal had failed in this task, but terminated the life support of the hibernating men, killing them in their sleep. Bowman was then forced to disconnect Hal, no easy task, and rely on the Hal 9000 systems on Earth to compute the breaking sequence needed to slow the ship into orbit around Saturn.

Japetus is famous for having one side much brighter than the other and Bowman notes that the dark side looks like the surface was burned, almost like charcoal and the bright side looks like a frozen lake of milk. In the middle of the milky lake, Bowman discovered the Big Brother of TMA-1, a giant monolith protruding from the planets surface. Realizing that the amount of food and oxygen left on *Discovery* would not be enough for him to last until the recovery ship *Discovery II* was sent to pick him up five years in the future, Bowman decided to make a journey to the planets surface to investigate the monolith close up.

Bowman left *Discovery* in one of the small space pods to “land” upon the monolith. In doing so, Bowman actually activated the monolith, which was nothing less than a Star Gate, and was transported across the Universe. Bowman’s trip across the stars led him to the ancient civilization that had so long ago abandoned their physical form and became one with the Universe. They bestowed upon Bowman the same transformation and thus Bowman became one with the Universe and choose to look upon the Earth until which time he felt comfortable with his new form.

Technology Review

Rail Track. The rail tracks in the book were used to launch the space craft Orion III into orbit. The booster rockets attached to Orion III would propel the space craft along the rail tracks

that stretched for miles across the ground. At the end of the track, there was a section of curved rails that directed the space craft into the air. This rail system is unlike anything we use today for space launches. Our launches are performed from the vertical launch position and land via an airplane.

Space Station One. The first stop any of the space crafts make when leaving Earth is to dock with the space station, Space Station One. This is an international space station with most funding coming from the Soviet Union and the United States, as apparent by the two administrative sections outlined in the book. Apart from the administrative side of the space station, all astronauts are free to intermingle at will. This space station has many components that match what we are using today. Our space station is an international venture, but we do not have separate divisions for administration and docking to the space station for refueling is a component that we recognize as a necessary platform needed to reach the inner planets and make the trip back to the moon.

All-Purpose Credit Card. The astronauts, and I believe all persons upon the planet Earth, have an all-purpose credit card that they use to make phone calls and purchases wherever they go. Although we do not have one single all-purpose credit card like the one illustrated in the book, we do have credit cards that allow us to purchase just about any item we see fit.

Inter-Computer Communication. The communication between computers is done in the form of binary light impulses. Communications between computers is still done in binary fashion today, but not from the old binary lights we tend to think of as relics of the old mainframes of the sixties.

Vision-Phone. The telephone communication system employed in the book is a type of vision-phone where both the caller and the receiver are able to view each other during the communication. While not in total use around the world, video conference phones, and phones for the hearing impaired that display the callers motions are some real world examples of this technology at work.

Moon Base. Upon landing on the moon, we find that there exists an underground moon base where a couple thousand engineers and scientists work and live day to day. This underground moon base is an expansion of Cold War technology and, as we are informed, anyone who had ever worked in a hardened missile site would not feel out of place in this moon base. We do not have, and do not plan to have, any manned moon base in the foreseeable future.

Satellites. There are many types of satellites mentioned in *2001*, the first of which is the orbiting moon magnetic surveying satellite. The satellite is used to make a full survey of the moon's surface to aid in the excavation of minerals, from this satellite survey we learn of the existence of TMA-1. There are many scientific satellites in orbit around our planet in the order described within the book. Magnetic surveying is just one of the varieties of measurements we take in order to better understand the world we live in, and the worlds around us.

Mobile Lab/Flex Wheels. Journey to the TMA-1 excavation site was made in a mobile laboratory. This laboratory is described as an outsized trailer on eight flex wheels with a maximum roving speed of around fifty miles per hour. The laboratory was large enough to comfortably house twenty men for a period of around two weeks. The laboratory also had flex wheels which consisted of many individual tiles that fit together to form the wheels of the laboratory. The wheels were designed in such a way that a few tiles could be lost without affecting the performance of the vehicle. To my knowledge, such a mobile laboratory does not exist, and neither do the platted "flex" wheels. While I can see the need for such wheels as described within the book, I do not think the technology has advanced enough to prove efficient in creating such a wheeled base.

Hibernaculum. The Hibernaculum is a hibernation pod that allows people to fall into a deep sleep for long journeys through space. The pod monitors pulse, respiration, and brain activity (EEGs). Body temperature is reduced to just above freezing to allow the body to remain in a state of suspended animation throughout the journey. The only modern day comparison to make to these hibernation pods, is the cryogenics chambers used to freeze the "near dead" to be revitalized in the future. And, so far, this is just science fiction as well.

HAL 9000. Hal, the heuristically programmed algorithmic computer, is a computer born of artificial intelligence. The book makes reference to Minsky and Good, two fictional people who in the 80s showed that neural networks could be generated automatically. This process is used in the creation of Hal who communicates with users using spoken word. There are six independently wired power systems with a final seventh system being a shielded and armored nuclear isotope unit. While advances have been made in artificial intelligence programs and neural networks, we are not at the point in history in which we can grow a computer system and teach it the necessities required to function in the real world.

Newspad. The electronic Newspad is a device that can grab any newspaper article and display that information to the user. The database that the Newspad grabs from is updated every hour. With RSS feeds on the internet to major news organizations, the concepts behind the Newspad have been completely realized within the past few years. But instead of hourly updates to news information, we can receive up to the minute information about breaking stories.

Discovery. The Discovery space craft is a ship with multiple pressure halls, plasma drive, and contain four liquid hydrogen cooling tanks. This ship is equipped with multiple Hibernaculums and has the third production Hal 9000 system. The space crafts of today do not resemble the ship described in the book. We are not able to send men to the outer reaches of the solar system, we do not have hibernation chambers, we do not have the type of propellant described, and we are also lacking the intelligent computer system that communicates with our astronauts in real time speech.

Space Pods. The extravehicular capsules, or space pods, aboard Discovery are designed to perform repairs missions to the ship during the long flight. The space pods are about nine feet in diameter and have two metal arms or “waldoes” for working on the ship. The pods are equipped with screwdrivers, jackhammers, saws, and drills and are capable of fixing just about any problem that comes up. Separately, the technologies described do exist today, but not for the purposes described therein. The single man submarines we have today are the closest comparison to the space pods described in this book as I can think of. We rely on special fitted space suits to perform the needed maintenance in outer space today.

The technologies described within *2001: A Space Odyssey* reflect the concepts and ideas at the height of the Space Age. Written in 1968, a year before the first voyage to the moon, people envisioned space technology to continue to expand in an exponential fashion. The same notion was apparent in the computer industry, with multiple advances in the 1960s, with integrated circuits and Japans focus on artificial intelligence research, the ideas laid out in this book seems plausible in the thirty years between the writing of the book and the book’s setting. The Oscar nominated movie script that this book is based on shows the effect the ideas and technologies had on society. Even today, *2001: A Space Odyssey* embodies the vision of the future and the possibilities of mankind.