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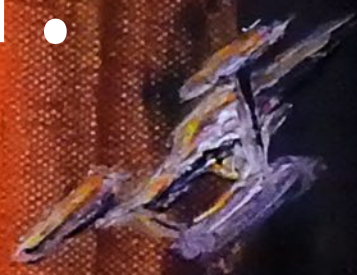
Eds.

Set Phasers to Teach!



Star Trek in Research and Teaching

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Set Phasers to "Teach"!

The Use of *Star Trek* in Research and Teaching

Edited by
Stefan Rabitsch,
Martin Gabriel,
Wilfried Elmenreich,
and
John NA Brown

Cover painting by Dr Victor Grech


Is “TEACH” the setting before or after “STUN?”

Preface: "Engage!" Science Fiction and Science Inspire Each Other and Move Society Forward

Science fiction and science enjoy a symbiotic relationship. At the same time, the genre creates a common societal terminology – which in turn is a rich source of ideas for thought experiments – sometimes down to the basic teaching efforts in classrooms across universities. I was inspired by warp drives, teleporters, replicators, and other technologies which found their way into *Star Trek* for dramaturgical or budgetary reasons. Many times, these stirred the naïve and fundamental "why not" question, so it is no wonder that the three technologies mentioned above have found their way into today's mainstream of both cultural reference and physics research.

Traditionally, science also fertilizes the science fiction genre, triggering new extrapolations and dramaturgical twists closing the loop of mutual inspiration. In my early career, I was privileged to participate in an ambitious and creative project with the European Space Agency (ESA). In 2002, the study "Innovative Technologies from Science Fiction" looked into science fiction literature, movies, and radio plays to search for ideas for new spaceflight-relevant technologies and see what the state of the art was in the "real world."

The spectrum ranged from virtual reality applications in telepresence, using transplantable contact lenses, as found in Robert Heinlein's "Waldo" (1942), and applied in today's Google Glass, to space elevators using carbon nanotubes, as found in Red Mars by Kim Stanley Robinson (1992), and applied today in NASA's annual space elevator challenge, and included Ram Scoop devices for antimatter engines as found in the original series of *Star Trek* which are at least studied theoretically as of now.

I was particularly fascinated by the idea of "living spacecrafts," as depicted by the Vorlon spaceships in *Babylon 5*, which are giant animals genetically engineered for space travel. In fact, there are research teams looking into tissue engineering in order to one day replace the traditional aluminum skin of space stations with biotissue that could spontaneously heal defects caused by micrometeorites. Stunning idea, isn't it?

The *Star Trek* universe is both an extrapolation of scientific exploration and a projection screen; a "clean sheet" approach to societal challenges. Radicalism, gender equality, and cultural diversity have been core topics since its inception five decades ago. No wonder the first kiss between a black woman (Lieutenant Uhura) and a white male (Captain Kirk) to be televised in the US stirred so much debate.

The handling of captured terrorists in the third season of Star Trek: Enterprise reflected societal concerns during the early years of the US-declared "war on terror."

In my daily work in the field of Mars exploration, we are sometimes so consumed by the everyday tasks of writing research proposals, teaching students, and working at the laboratory that we forget about the grand perspective. We are literally standing on the shoulders of giants when it comes to engineering and scientific progress, and on the shoulders of other giants when it comes to the vision of a better tomorrow.

There are these glittering moments of pure joy, when we are walking with a spacesuit simulator on the ridge of a Mars-like desert in the Northern Sahara, emulating the first human landing on the Red Planet. During these moments, we get a rare glimpse of the world of tomorrow in a very visceral way and suddenly feel as though we understand how the future is made.

Back at University, I try to convey that fascination – this "itching for things yet to come" – when I teach planetology and talk about the valleys and mountains of Mars. When I mention "Utopia Planitia," an open plain in the largest impact basin of the Northern Hemisphere of Mars, I see some of my students smiling. They know very well that right there, in the Utopia Planitia Fleet Yards, in the year 2363, our descendants will build the starship *Enterprise-D*.

In this spirit: "Engage!"

Austrian Aeronautics and Space Agency
(Agentur für Luft- und Raumfahrt)
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"With A Wondrous Leap of the Imagination": *Star Trek* as Beacon and Compass

> "The Starship Enterprise is not a collection of motion picture sets or a model used in visual effects. It is a very real vehicle; one used for storytelling.
> You, the audience, furnish its propulsion. With a wondrous leap of imagination, you make it into a real spaceship that can take us into the far reaches of the galaxy and sometimes even the depths of the human soul.
> The purpose of all this? To show humans as we really are. We are capable of extraordinary things." (Gene Rodenberry, in his *Introduction to Star Trek: The Next Generation Technical Manual*)

We picture the world around us as a series of mental maps, and orient ourselves in them in order to make sense of where we are in relation to the paths that have gotten us here and the possible paths towards our goals [1]. For most of us, this is an almost entirely unconscious process. We may be aware of some of the maps we are using, but we are rarely aware of all of them. Even when we are consciously using one map, we are rarely aware of the bigger picture involved, rarely cognizant of the way that this particular map has framed our perspective, or of how it overlaps with the other maps we use [2].

One of the roles of an academic is to be a mapmaker; developing more and better mental maps of the world around us. This leads to the accumulation of a mental Atlas, if you will forgive my limited imagination, a collection of mental maps that reflects the way that academia sees and understands the world.

Equally important is the role of navigator; testing the ways in which these maps can be used, individually and in combination. Of course, like any navigator, we must never forget that when our mental maps disagree with what we learn during our explorations, it is the duty of the academic to revise the map, rather than to insist that an old map valid when it is not [3].

These two roles – making mental maps and amending them through real-world exploration – help civilization navigate new paths and, incrementally, increase our understanding of the universe and our place in it. Academia gives us a place in which to perform these two roles – which we call research – and to teach others to do the same. This is how we make more researchers, and more teachers, and so ensure that the exploration will continue on into the next generation.

The primary goals of a teacher are to help students add detail to their existing mental maps, and to help them see the need to add new mental maps to their personal mental Atlas, and maybe more.

The primary roles of the researcher are either to fastidiously copy existing maps and mapmaking methods in order to test them, or else to use the academic environment to innovate; developing and testing new maps or mapmaking methods that are more accurate, precise, or robust.

But making a map of new territory requires more than navigational tools and a solid knowledge of what has come before, it requires broad and deep, well-informed speculation of what might be out there. For 50 years, across many academic domains, *Star Trek* has been an inspiration in that speculation.

In this volume, you will find examples of how the authors have used *Star Trek* in their teaching and in their research. Many of the papers stem from presentations that were made as part of the *Star Trek Ringvorlesung*, a semester-long lecture series at the Alpen-Adria Universität Klagenfurt (Klagenfurt University) in the fall/winter term, 2015/16 [4]. Those papers, and the others in this volume, represent more fields than you might have thought possible. Each chapter begins with a brief commentary; excerpts from the Editors' Log. These short statements include a quote from a particular *Star Trek* episode or film, and a few words to set the chapter in context and prepare the reader for a particular approach, field, or perspective. *Star Trek*'s race of logicians, the Vulcans, aspire to infinite diversity through infinite combinations [5, p 34]. While infinity is beyond our grasp, we have tried to represent a broad diversity of realms, approaches, and perspectives in this volume.

Mathias Lux teaches about video games. In "Playing Captain Kirk," he and John NA Brown ponder whether or not it is possible to build a game based at once on the concepts of cooperation and exploration that are key to *Star Trek*, and on the concepts of immediate reward that are fundamental to game design.

Erin K. Horáková examines how the original adventures of the crew of the USS Enterprise reflected the shifts in American-Jewish identity that were taking place in the mid-twentieth century, in her chapter entitled "From 'Shalom Aleichem' to 'Live Long and Prosper': Engaging with Post-War American Jewish Identity via Star Trek: The Original Series."

In "How to Name a Starship: Starfleet between an Anglo-American bias and the Ideals of Humanism," Martin Gabriel looks at how the names of *Star Trek*'s ships reflect the historical prejudices of Anglo-American culture rather than the universal humanism espoused in the franchise.

Gerhard Leitner is a psychologist and computer scientist who specializes in designing and implementing real-world smart home systems. In "The Computer of the Twenty-Third Century: Real-World HCI Based on Star Trek," he and John NA Brown propose that the greatest differences between the computers used by Kirk and those we use today are reliability and ease of use.

Mapping the often-overlooked transatlantic double consciousness of *Star Trek*, Stefan Rabitsch locates the origins of that science-fictional world vis-à-vis the American zeitgeist of the Kennedy Era in his chapter entitled "'Wagon Wheels, Sails, and Warp Cores' Star Trek: Between Allegory and World-Building."

In "'Ready to Beam Up?' Star Trek and Its Interactions with Science, Research and Technology," Joachim Allgaier charts the many ways in which *Star Trek* inspires real-life technological progress: from cellular phones to new medical tools.

Carey Millsap-Spears delivers a ready-to-use manual for introducing college students to academic thinking and writing through intellectually stimulating prompts based on potentially "challenging" topics, in "Teaching with Trek: Star Trek, the LGBTQ+ Community, and College Composition."

In "'My People Once Lived in Caves' Pre-modern Societies in Star Trek," Christian Domenig and Stefan Rabitsch address the question of whether human history can be seen as a universal phenomenon, in a discussion of how the franchise dealt with societies that are not as technologically advanced as the Federation.

Lukas Esterle teaches collective computing. His chapter, "'Resistance Is Futile': Using the Borg to Teach Collective Computing Systems," presents some of the ways in which real-world computer collectives defy the expectations of students whose knowledge of such systems is limited to fiction.

In "Telepathic Pathology in Star Trek," Victor Grech compares the pathology of real-world diseases to the dissemination and spread of telepathic "infections" in Star Trek.

In his chapter "La Forge's VISOR and the Pictures in Our Heads: Understanding Media Studies," Nathanael Bassett uses Geordi LaForge's VISOR, which is both the medium and the message, as a spectrum-enhancing lens through which to view the basic tenets of Media Studies.

As showcased in "'Where Many Books Have Gone Before' Using Star Trek to Teach Literature," Elizabeth Baird Hardy inspires her students to read literature in and across context, by showing that books still matter, especially to the scientists and explorers in Star Trek's technologically-advanced future.

In "The Energy System in Star Trek and Its Real-Life Counterparts," Wilfried Elmenreich uses the fictional tropes of energy usage in *Star Trek* to illustrate the need to apply disciplined engineering principles in the real world.

Recognizing that others have their own minds, separate but equal to our own, is a fundamental part of being a cognitively mature human. In "To Seek Out New Forms of Knowledge: Difference, Theory of Mind, Cognitive Narratology, and Star Trek," Vivian Fumiko Chin shows her students examples of empathy and respect for diversity from Star Trek, in order to introduce them to theory of mind, and to help them see how narrative can play a role in that process.

In "Logic Is the Beginning of Wisdom, Not the End: Using Star Trek to Teach Scientific Thinking," John NA Brown discusses the inbuilt weaknesses in human perception and thought, and shows that the acceptance of one's own ignorance and irrationality is a necessary first step in learning the very unintuitive processes that might be the greatest mental tool ever developed.

The "undiscovered country" we are exploring is not the one that Shakespeare expressed in Hamlet's famous soliloquy [6]. "The undiscovered country from whose bourn no traveler returns" was used to describe death. This is the "undiscovered country" of the sixth *Star Trek* film [7]: the unknown future to which every individual human can aspire, but which remains forever out of any individual grasp. To do our part, we must conduct research and we must teach, making sure as best we can that we have built a foundation broad and strong enough to support those who will come next, and extend our grasp, per aspera, ad astra [8].

We encourage you to join in our star trek as we attempt to prepare the next generation to carry on in our place; to be a fellow voyager in this enterprise; to boldly go into this shared journey, not into deep space [9] but into discovery.

Prosperity and long life,
John,
on behalf of Steve, Martin, and Wil.

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John N. A. Brown

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About the Editors

Stefan 'Steve' Rabitsch is fixed-term assistant professor in American Studies at the University of Graz and teaches courses in American cultural history at the University of Klagenfurt. A self-declared 'Academic Trekkie', he is going to publish his first monograph, *Star Trek's Secret British History*, with McFarland in 2018. He is co-editor of *Fantastic Cities: American Urban Spaces in Science Fiction, Fantasy, and Horror* (UP Mississippi, 2018). He is also a founding editorial board member of JAAAS: *Journal of the Austrian Association of American Studies*. In his endeavors, he focuses on American Cultural Studies and Science Fiction Studies across media.

Martin Gabriel studied history at the University of Klagenfurt (Austria). He has been a member of the department of history since 2008, and a lecturer in modern history since 2012. His publications and university teaching activities focus on the history of empires (primarily Austria-Hungary, Britain, Spain, and the USA), colonial warfare, and social as well as cultural history in the period from c. 1600 to 1890.

Wilfried Elmenreich is Professor of Smart Grids at the Institute of Networked and Embedded Systems at the Alpen-Adria-Universität Klagenfurt, Austria. He studied computer science at the Vienna University of Technology, where he received his doctoral degree in 2002 and his venia docendi in the field of computer engineering in 2008. He is editor and author of several books and published over 150 papers in the field of networked and embedded systems. Elmenreich is senate member of Alpen-Adria-Universität Klagenfurt, Senior Member of IEEE, and counselor of the Klagenfurt's IEEE student branch. His Erdös Number is 3.

John N. A. Brown has published two previous books with Springer and has lectured around the world. He is an inventor, designer, and researcher specializing in Human Factors and the User Experience. His approach to Human-Computer Interaction is based on applying mindful and informed iteration to shape tools that suit human abilities and limitations. After all, we don't have time to wait for the cross-generational processes of evolution and adaption that naturally make tool use both effective and comfortable. Dr. Brown calls this approach Anthropology-Based Computing.

"Where Many Books Have Gone Before": Using Star Trek to Teach Literature

Elizabeth Baird Hardy

Abstract

On *Star Trek*, the crew members of the *USS Enterprise* have a number of impressive tools at their disposal, from phasers to tricorders. Yet, one of their most useful items is one to which we already have access today: literature. From Shakespearean-line titles in *Star Trek: The Original Series* (*TOS*), to the Dickensian and Melvillean themes in *Star Trek II: The Wrath of Khan* (*ST:II*), to Data and his Sherlock Holmes fixation, literature has always served as a template for *Star Trek*, reinforcing its continued power and relevance; even in a world of interplanetary travel, real books still matter. This emphasis on literature makes *Star Trek* an excellent teaching tool. As *Star Trek* privileges texts, particularly the classics, the series and films can be used to effectively teach literature, from providing intertextual references to specific works to providing excellent examples for teaching concepts and themes in literature. In addition, *Star Trek* clearly portrays the value of literature and literary studies, even for those whose lives and work are outside traditional roles in the humanities.

Keywords

Literature · William Shakespeare · Allegory · Metaphor · Intertextuality

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Editors' Log: Chapter 1

Its setting in a distant future notwithstanding, *Star Trek*, from its beginnings, has always shown a strong affinity for the works of classic English literature. In her essay, Elizabeth Baird Hardy deals with *Star Trek*'s use of literature from Shakespeare to Dickens, and explores the possibility of teaching literary studies by referring to this iconic science fiction show. She also demonstrates the great value many *Star Trek* characters attribute to literature. Even though they are working in fields with a strong focus on science and technology, they enjoy reading classic pieces and internalize humanist attitudes. **-Eds.**

***Star Trek: The Original Series*, 01×24, "Space Seed" (1967)**
Kirk: *Mister Spock, our heading takes us near the Ceti Alpha star system.*
Spock: *Quite correct, Captain. Planet number five there is habitable, although a bit savage, somewhat inhospitable.*
Kirk: *But no more than Australia's Botany Bay colony was at the beginning. Those men went on to tame a continent, Mister Khan. Can you tame a world?*

(continued)

Khan: *Have you ever read Milton, Captain?*
Kirk: *Yes. I understand.*

Star Trek: Deep Space Nine**, 03×20, "Improbable Cause" (1995)**
Garak*: But I'm sorry, Doctor, I just don't see the value of this man's work.*
Bashir*: Garak, Shakespeare is one of the giants of human literature.*
Garak*: I knew Brutus was going to kill Caesar in the first act, but Caesar didn't figure it out until the knife is in his back.*
Bashir*: That's what makes it a tragedy. Caesar couldn't conceive that his best friend would plot to kill him.*
Garak*: Tragedy is not the word I'd use. Farce would be more appropriate. Supposedly, this man is supposed to be the leader of a great empire, a brilliant military tactician, and yet he can't see what's going on under his own nose.*

Many years ago, I made a general nuisance of myself in every one of my high school English classes with a frequent habit of pointing out the ways in which the texts or concepts we were currently studying overlapped with *Star Trek.* Though the harried teachers who undoubtedly tired of these comments might not agree, the groundbreaking television episodes and films that chronicled the adventures of Captain James T. Kirk (William Shatner) and his crew were actually crucial in my own development as a student and, with the addition of the programs and films that have emerged since, have continued to serve a valuable role in my scholarship and my own teaching. *Star Trek*'s strength, in many ways, lies in its ability to use a fresh approach to tell the old stories, the ones that matter. Thus, it is a valuable tool, as versatile as a tricorder and as effective as a phaser, in the teaching of literature, literary concepts, and themes. At the same time, *Star Trek* can help to reinforce the perception that literature is neither a chore nor a burden, but a pleasure that remains relevant even in a world littered with a vast array of technological wonders and distractions.

"Strange New Worlds": The Value of Intertextual Understanding

As a college professor whose students hail from a wide variety of disciplines and backgrounds, I am deeply aware of the challenges in reaching each student and in helping each student to understand texts that also hail from a wide variety of disciplines and backgrounds. Many students who enroll in my survey classes have little interest in pursuing long-term literary studies. They merely enroll in a course to meet program requirements; and, literature, particularly literature composed centuries ago in another culture, presents unwelcome challenges to their skills and interests.

Intertextual analysis, seeing how one text intersects with another, is a vital tool in helping these students both understand and appreciate literature. Just as each planet of the Federation is connected to the whole, literary texts are also not products of a vacuum. Instead, both the great works and contemporary texts are part of a network, with one author influencing another, who in turn influences still others. Helping students understand intertextuality provides them with tools for understanding what they read and also provides them with context for the larger understanding of literature as an interconnected web. For example, students can learn how John Donne's metaphysical concepts of poetry influence the style and content of America's first published poet, Anne Bradstreet; they may then find Bradstreet's complex metaphors to be less daunting, while at the same time recognizing the power of Donne's influence and the scope of metaphysical themes. Students who have experienced the works of Chaucer may have a greater appreciation for Edmund Spenser, who intentionally drew from and mirrored Chaucer's style, and understanding those connections is a critical step in the process of seeing a whole text and its layers of meaning.

Unfortunately, few of my students come into a survey class with a solid working knowledge of Donne or Chaucer, so intertextuality provides a valuable lifeline. Though they may not know much about some of the texts we typically study in a literature course, they may know popular literature that draws on those texts. Whenever possible, I seek those intertextual lifelines, reminding my students that we could not have *The Hunger Games* trilogy (2008–2010) without Shakespeare and that there would be no *Harry Potter* novels without Dickens. For these students, the intertextual nature of *Star Trek* is valuable on multiple levels, as *Star Trek* is both an intertextual experience drawing on a huge variety of texts, and a demonstration of the ways in which intertextuality functions as a tool for understanding our world and ourselves even as it helps us understand literature. Students who have experience with *Star Trek* have, whether they know it or not, already started to explore the wide and complex universe of intertextuality.

"Ahab has to Hunt his Whale!": *Star Trek* as a Tool to Teach Specific Texts

One has to wonder if the episodes of *Star Trek,* especially *Star Trek: The Original Series* (*TOS*), would have even had titles at all if there had not been the greats of literature to provide those riveting phrases like "Whom Gods Destroy", "All Our Yesterdays", and "That Which Survives".[1] Shakespeare, of course, contributed a whole slew of lines that became titles for *TOS* episodes. Numerous other authors' works have been mined, sometimes with slight alterations, for the titles of episodes and films. Using these titles can be an effective method of introducing students to

[1] The titles are taken, respectively, from Henry Wadsworth Longfellow's "Masque of Pandora" (1875), William Shakespeare's *Macbeth* (1606), and Percy Bysshe Shelley's "Ozymandias" (1818).

the original texts they reference. For example, "By Any Other Name," an episode that explores both the strengths and weaknesses of the human condition as they are experienced by an alien race, takes its title from Juliet's pivotal balcony speech in Act II of *Romeo and Juliet*. This title can serve as an effective introduction to the iconic, but often misunderstood and misinterpreted speech. When Juliet ponders "Wherefore art thou, Romeo?" [1, II, ii,32], she is not asking his location, as so many first-time readers of the play have assumed, but rather she is questioning the nature of naming, considering the power of a name. She analyzes the possibility that it is the nature of something, or someone, which should be judged, not the superficial impression of a name; thus Romeo must be accepted or rejected based not on his Montague name, which instantly disqualifies him from Juliet's affections, but by his compelling and attractive character. With an episode title as an introduction, a class can be effectively led into a discussion of the text from which it was borrowed.

Shakespeare's contributions to *Star Trek,* of course, extend far beyond mere lines borrowed for titles, as entire episodes revolve around large sections of his plays and can serve as effective tools for introducing the original texts. Featuring a mass murderer masquerading as a Shakespearean actor, the *TOS* episode "The Conscience of the King" takes its title from *Hamlet* (1603) and includes segments of performances. Using these vignettes as an introduction to *Hamlet* not only provides an unusual performance context, but also reinforces the Shakespearean use of the play-within-a-play motif. Employing performance within the story, Captain Kirk, like Prince Hamlet before him, wrestles with his role as an instrument of justice and uses theater to prick the conscience of a murderer.

TOS is also not unique in providing unusual context for Shakespearean performance. Thanks to the advanced technology of Captain Jean-Luc Picard's (Patrick Stewart) *Enterprise-D*, Shakespearean drama goes beyond performance and provides immersion, as crew members can enter Shakespeare's stage-play world and take upon themselves any characters they choose. One of the best illustrations of the power of Shakespeare is in an episode of *Star Trek: The Next Generation* (*TNG*), titled "The Defector." Data (Brent Spiner) portrays Henry V as part of his ongoing research to understand the mindset of humanity. The holodeck performance provides a wonderful example that can be used in class discussions and analysis alongside other outstanding *Henry V* adaptations such as the *Henry V* segment of the BBC's *The Hollow Crown* (2013–16) and Kenneth Branagh's landmark film (1989) that Data actually lists as one of the performances he has studied.[2] Even more, though, the holodeck sequence shows beautifully what Shakespeare was doing in his own plays. While Data is playing a disguised Prince Henry seeking to understand the mental situation of his troops, one of those soldiers is actually played by Patrick Stewart, Captain Jean-Luc Picard. Stewart, a highly regarded Shakespearean actor, also appears in numerous readily available adaptations that make effective

[2] The reference to Branagh is slightly humorous, listing his performance alongside Olivier's though Branagh's *Henry V* was still in theaters at the time the episode aired.

teaching aids, as students are often delighted to recognize him.[3] Thus, the sequence shows very effectively the way in which Shakespeare's characters try on and switch roles and identities and dramatically illustrates the blurred borders between actor and character so common in the Bard's plays.

Certainly Shakespeare is not the only author whose works can be effectively taught through *Star Trek*. The holodeck allows Data to also indulge in his fascination with Sherlock Holmes to such an extent that the Moriarty figure becomes a self-aware villain able to function independently as a threat to the ship and crew in the two *TNG* episodes "Elementary, Dear Data" and "Ship in a Bottle." Students, especially those who are in college courses and those who have been exposed to many other popular Holmes adaptations, may find the works of Sir Arthur Conan Doyle easier to grasp than other texts; these students may thus be less in need of a *Star Trek* episode as a supplemental resource. Even so, the way in which the holodeck initially offers Data a pastiche of the original Holmes stories as a mystery for him to solve, makes an excellent starting point for discussion on the large canon of the Holmes texts and on their continued cultural interest and relevance.

In addition to the individual television shows, the *Star Trek* films are powerful tools for teaching specific pieces of literature. What is especially intriguing about the films' use of literature is that the same texts are appropriated by different characters for completely different purposes, revealing the power of interpretation and helping students to understand that how we read a text, particularly these powerful classics, exposes our own position as much as it does the position of an author. In *Star Trek II: The Wrath of Khan* (*ST:II*), Commander Pavel Chekov (Walter Koenig), himself named for the great Russian author and thus providing a wonderful connection for classes beginning studies of his short stories or plays, makes a critical discovery that begins with books. Though it is finally the name of the *SS Botany Bay* that reveals to Chekov that he and Captain Terrell of the *USS Reliant* have stumbled directly into the lair of the tyrannical genius Khan Noonien Singh (Ricardo Montalban), the books on the shelf are his first clue. Among them is John Milton's *Paradise Lost* (1667), which had been referenced by Khan in his original episode appearance, "Space Seed."[4] At the time of his exile, Khan proudly declares with Milton's Satan that it is "better to reign in hell than to serve in heaven" [3, I:263]. Ironically, Ceti Alpha V was a planet with good resources and possibilities at the time Khan and his people were left there by Captain Kirk, but it was quickly transformed by the unforeseen explosion of its neighboring planet into an environment that could aptly be described as hellish. Thus, Khan reveals the power of text, but he also stresses that same power as he and Kirk each embrace a different classic of

[3] In connection with the *Henry V* holodeck performance, Stewart portrayed John of Gaunt in the *Richard II* (2012) installment of the BBC's critically acclaimed *The Hollow Crown*, while Benedict Cumberbatch, Khan in the reboot film *Star Trek Into Darkness* (2013), plays the titular Richard III (2016).

[4] Ironically, the character of Chekov did not appear in *TOS* "Space Seed," the episode that introduced Khan, though Commander Chekov and Khan remember each other clearly. Khan even claims that "I never forget a face," before recalling Chekov's name [2].

western literature. Kirk carries with him and quotes from his copy of *A Tale of Two Cities* (1859) by Charles Dickens, a birthday gift from Captain Spock (Leonard Nimoy), while Khan repeatedly quotes from Herman Melville's *Moby Dick* (1851), taking on the role of Ahab, mad with revenge and power as he goes down with his ship, leaving ruin and death in his wake. By comparing Khan's use of *Moby Dick* to the way in which the same text is used by Lily Sloane to effectively convince Captain Picard in *Star Trek: First Contact* (*ST:VIII*) to give up his own doomed quest for revenge, students can not only see how these great works serve critical roles in the *Star Trek* world, but also can perhaps better understand both the original texts and the way readers process and internalize them. Because Picard, unlike Khan, realizes he is on the path to becoming enslaved by his own thirst for revenge, he is able to save his ship, Data, and the future of humanity. Khan, with his characteristic "two-dimensional thinking" cannot resist the temptations of revenge, and thus cannot learn from and resist the fate of Ahab.

Another literary film villain demonstrates the way these great texts can be interpreted differently by different readers. In *Star Trek VI: The Undiscovered Country* (*ST:VI*), the Klingons prove to be great fans of Shakespeare whose *Hamlet* provides the subtitle, though they prefer his texts "in the original Klingon" [4]. The treacherous General Chang, played with theatrical relish by legendary actor and Shakespearean Christopher Plummer, quotes repeatedly from Shakespeare during his maddened quest to prevent peace and to further foment hostilities between the Klingon Empire and the Federation, hostilities that validate his existence as a military figure and his prejudices about the Federation. Finally vanquished, he admits both personal and ideological defeat by asking, as does Hamlet, "To be, or not to be?" [5, III, i:56].

The countless examples of *Star Trek*'s subtle and overt usage of literary texts and figures provide a rich selection of tools to draw students into greater understanding and enjoyment of texts that may seem daunting and dry until they are being recited by Klingons or performed by androids.

"No more metaphors, Bones. That's an order": Learning Literary Concepts and Techniques Through *Star Trek*

As well as teaching students to appreciate and enjoy specific texts from the canon of great literature, *Star Trek* also offers a fantastic array of examples for the teaching of general literary concepts and terms. While a student, particularly a student in a survey literature course, might struggle to understand literary terms when they are presented in the abstract, an illustration from *Star Trek* can prove useful and engaging. For example, a concept like allusion, when it is presented as a colorless example, may elude students, who constantly confuse 'allusion' with 'illusion.' For these students, who struggle to understand that an allusion is a reference to another text, there is no better illustration of the power of allusions than *TNG*'s "Darmok," an episode in which Captain Picard is stranded with his counterpart from an unfamiliar species and must struggle to communicate with him; the Tamarian's language seems

completely nonsensical and befuddles even the universal translator. When Picard finally realizes that the language consists almost entirely of allusions to the great literature of the Tamarians, he is able to build a relationship and share his own literary allusions, drawn from the *Epic of Gilgamesh*, as he begins to communicate.

Allusion is perhaps the literary technique with which *Star Trek* is most littered. Students can both learn the concept and benefit from the exposure to the great books, as when they look up "The Song of the Wandering Aengus" (1897), the poem by William Butler Yeats that was a lullaby for *Enterprise*'s Captain Jonathan Archer [6]. If they connect that same captain's beloved beagle, Porthos, to his namesake in Alexandre Dumas's classic *The Three Musketeers* (1844), they may also notice that this novel is the source of the lines uttered by Sulu in the *TOS* episode "The Naked Time," when he takes on his iconic swashbuckler pose that leads Captain Kirk to call him "D'Artagnan" [7]. Learning to recognize both subtle and overt allusions in *Star Trek* is a strategy that can increase students' awareness of what they read as well as reinforce their understanding of the technique.

Symbol, allegory, and metaphor are nearly as challenging for students as allusion, and *Star Trek* can be remarkably effective in helping students understand each of them. Students who have trouble grasping symbols like those employed by Nathaniel Hawthorne in *The Scarlet Letter* (1850) or "Young Goodman Brown" (1835), or who struggle to penetrate the allegorical meaning of those texts, may nonetheless easily grasp symbols ranging from Kirk's spectacles to the *Enterprise* herself. Kirk's pair of reading glasses, grudgingly accepted as a birthday gift from Doctor McCoy (DeForest Kelley), change meaning throughout the films, from a necessary but resented tool to a cracked and useless relic thrown down after Spock's funeral; later, after Spock's restoration, Kirk pawns the spectacles in twentieth-century San Francisco, aware that they "will be again" a birthday gift [8]. Like the Scarlet Letter borne by Hawthorne's Hester Prynne, the spectacles shift meaning, beautifully illustrating the way in which an author can use a symbol to represent character growth and transformation. Likewise, the *Enterprise,* a powerful symbolic setting that can represent a human microcosm or a jealous mistress, can help students grasp symbolic settings like the forest where Hawthorne's "Young Goodman Brown" loses both his Faith and his faith.

Allegory, using a whole series of symbols to tell a story that mirrors a deeper, often spiritual, story, can clearly be seen in *Star Trek*. Students, who may not immediately notice Hawthorne's allegories, may readily penetrate the allegorical levels of the *TOS* episode "The Apple." or of Spock's sacrifice to save the ship and her crew from the actual *Kobayashi Maru* scenario in *ST:II*.

Metaphor may be difficult for students to grasp in literary studies, but *Star Trek* is rich with metaphors commenting on topics and events from racism to the Cold War. The relationship of the Federation and the Klingon Empire is a remarkably clear illustration of metaphor, reflecting the complex relationship of the United States and the Soviet Union/Russia. As the two actual world powers phased from espionage and smoldering conflict to uneasy allies through the break-up of the Soviet Union, their metaphorical counterparts, the Federation and the Klingons, mirror similar steps and challenges. They reflect each other and provide for students

an excellent illustration of metaphor that may prove incredibly valuable when addressing complex literature.

Other literary terms and techniques are frequently and beautifully illustrated throughout *Star Trek.* Data's struggle to understand figurative language, Mr. Spock's comic attempts to inject profanity into conversations, and Doctor McCoy's frequent colorful analogies and metaphors provide a wide variety of vibrant examples of the sometimes daunting and confusing world of English language and letters. A teacher who can draw in examples from *Star Trek* has a powerful ally in combating the confusion literature can foster in struggling students.

"Something Spock was trying to tell me on my birthday": Literary Themes in *Star Trek*

Like literary terminology, literary themes also find a universe of expression in *Star Trek*, where unconventional settings and characters depict the same powerful ideas that have driven literature from its very beginning. Those themes, which undoubtedly account for much of the incredible longevity of the entire *Star Trek* franchise, can make an effective bridge to understanding and appreciating the literature that so beautifully embodies them. Students mesmerized and moved by Spock's devastating solution to the *Kobayashi Maru* scenario in *ST:II* may better understand, as Kirk so clearly does, the theme of self-sacrifice when they encounter it in texts like Charles Dickens's *A Tale of Two Cities*. At the same time, they can see, in Khan's imminently selfish decisions, the destructive power of revenge and pride, themes woven through *Paradise Lost, Moby Dick,* and many of the other great books.

Perhaps one of the most effective literary themes that winds its way through the *Star Trek* universe is that of the impact of even minor choices. In Robert Frost's iconic poem, "The Road Not Taken" (1916), the speaker faces a decision between two roads that are essentially the same, yet generations of students in college literature survey courses have misunderstood the poem, conflating it with Transcendentalist ideals of self-determination and individuality. Just as casual viewers may have assumed that *Star Trek* was something very different than it actually is, casual readers have often misquoted and misunderstood what is possibly Frost's best-known poem. Frost is not urging readers to take the untraveled path, blazing a trail into the wilderness; he is describing the struggle of a person who stands at a crossroads, where "two roads diverged in a yellow wood" [9, p. 1]. The speaker, though attempting to look down each road and ascertaining that the "passing there had worn them really about the same" [9, p. 10], finally decides on a path, but acknowledges that the untraveled road, the one he did not choose, will haunt him as he will always wonder what would have happened if he had chosen it instead. *Star Trek* makes a marvelous illustration for understanding Frost's true meaning and themes. Some choices may only lead to slight changes in one's reality, as in the *TNG* episode "Parallels," in which Mr. Worf (Michael Dorn) finds himself sliding between a host of realties, each just slightly different, all influenced by alternate paths he might have followed with just one changed decision. In other circumstances, the small

choice may have catastrophic, long-reaching effects, as when Dr. McCoy saves the life of Edith Keeler in the *TOS* episode "The City on the Edge of Forever" and inadvertently creates a world in which the Nazis win World War II and the Federation never exists. Since time travel is a frequent motif in *Star Trek,* the accidents that can be created by changing even small decisions make excellent support for Frost's argument.[5]

Nearly any theme that poems, novels, plays, and short stories can present, *Star Trek* has, at some time or another, conveyed in an engaging manner that can draw in students and help them to see that the texts we study as literature tell the same stories *Star Trek* tells: stories about what it means to be human.

"You'll find it in all the literature of the period": Literature as Pleasure

Perhaps the most important lesson *Star Trek* teaches about literature is not one that will ever turn up on a test or quiz. It is not a lesson about a character in a play, a plot point in a great novel, a vocabulary word, or a theme from one of the great books. Instead, it is a lesson about how we read. The greatest lesson *Star Trek* teaches about literature is that literature matters, that it is beneficial to us as a species.

In the world of *Star Trek,* books matter. Whether it is the antique volume of Shakespeare in Picard's quarters or holodeck experiences that take crewmembers into books historical and contemporary, literature is a valuable part of these characters' lives. Though they have a wealth of technological diversions for entertainment and education, they still choose literature, printed words on a page. They read because they enjoy reading, not because there is nothing else to do. They even enjoy pretending to be characters from their favorite books, a delightful mirroring of the way in which fans enjoy pretending to be characters from *Star Trek.* Books also possess power. From the literal power of a text like the Chicago gangland history that shapes the Iotian culture in the *TOS* episode "A Piece of the Action," to the subtle power of Lily's reminder that Picard is acting like Captain Ahab in his obsession with the Borg, to Data's identification with Pinocchio and his quest to be a real boy, texts possess the ability to transform reality, to make the world different, a power impressive even for people armed with phasers and able to beam to different planets.

Critical to this point is the fact that the vast majority of the characters in the *Star Trek* universe, these people who read voraciously from dusty old tomes that would be antiques in the twenty-first century, who readily spout quotations from seventeenth-century poets, and who even immerse themselves in the texts of the classics, are scientists. They are not English teachers, librarians, and bookshop owners. They are engineers, physicists, astronomers, computer scientists, and biologists, people whom we would assume have no "use" for books, unless they are technical

[5] Perhaps nothing in the *Star Trek* franchise epitomizes this theme as drastically as the 2009 reboot, in which one shipful of accidental time-travelling Romulan miners changes the trajectory of James Kirk's life, and thus alters the whole original timeline.

journals, like those that Scotty enjoys reading.[6] Yet, they not only enjoy literature, but they weave it thoroughly into every aspect of their lives and work. Thus students, who sometimes wonder why they have to read literature when they are majoring in engineering, physics, astronomy, computer science, or biology, can be reminded that we don't read just because we have to: we read and enjoy literature because we are human.

In teaching literature with *Star Trek,* certainly the savvy instructor can help students to see the deeper meaning of actual texts and appreciate both the elements of literature and its themes. However, the most compelling benefit this far-reaching franchise can offer to the instruction of literature is the reminder that literature, like *Star Trek* itself, is meant to teach us while it brings us pleasure. Like Captain Picard, Captain Ahab provides both thoughtful commentary on our existence and a riveting story we want to follow. Just as the first viewers who tuned in for the next thrilling adventure of the crew of the *Enterprise* also wrestled with issues of civil rights and national identity, readers of Dickens avidly followed each serialized installment to find out whether Little Nell lived or died or if Pip ever made his fortune, in the process developing strong feelings about child labor and the treatment of the poor. If students can see literature as we see *Star Trek,* as a pleasurable experience that also enriches us as humans, then they can see literature the way that the characters in *Star Trek* see it, and that will indeed be an on-going mission well worth the journey.

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[6] Scotty, confined to quarters for starting a bar fight with the Klingons over their insults to the *Enterprise,* is cheered by the fact that he will have time to catch up on his technical journals [10].

From 'Shalom Aleichem' to 'Live Long and Prosper': Engaging with Post-war American Jewish Identity via *Star Trek: The Original Series*

Erin K. Horáková

Abstract

Star Trek: The Original Series (*TOS*) was produced at a time when American Jewish identity was undergoing profound shifts. Jews were becoming less marginalized in American society, less persecuted, more upwardly-mobile, and more central to American national self-conceptions. This essay will gloss that historical context and position the show's lead actors, Leonard Nimoy and William Shatner (both second-generation Ashkenazi/Eastern-European Jewish immigrants), in this framework, locating them simultaneously in discourses of community representation, alien otherness and passing. The chapter will examine the acknowledged and subterranean ways these actors' performances are inflected by this identity, as well as the show's textual attempts to reckon with the Shoah (Holocaust) in episodes like "The Conscience of the King" and "Patterns of Force" (this was also an era in which the Shoah was being reassessed, and more broadly culturally cathected as trauma). *Star Trek* provides an excellent means of teaching this range of Jewish cultural figurations and historical experiences, as well as teaching media criticism as a transferable skillset. In its dealings with Jewishness, *Star Trek* both fails and succeeds grandly, as art and as an articulation of its professed progressive inclinations. In using *Star Trek* as a means of discussing a moment in Jewish experience, we can open up classroom conversations about how the changes of this period have given rise to the US Diaspora's current 'Americanization'; how later *Star Trek* has negotiated this terrain and complicated these initial portrayals; and, more broadly, how media arises from and participates in shaping its era.

Keywords

Jewish Studies · History · Cultural history · History of performance · Cultural studies · Trauma theory · *Star Trek*

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Editors' Log: Chapter 02

Star Trek: The Original Series featured two leading actors of Ashkenazi descent, Leonard Nimoy and William Shatner. As Erin K. Horáková shows in her chapter, the show subtly incorporated elements of Jewish culture, and also dealt directly and obviously with contemporary and historical issues at a time when Jewish American identity was changing dramatically. The series now provides an entry point for research and teaching in these fields, and a perspective on the important interactions between popular media and cultural identity. (**Eds.**)

***Star Trek: The Original Series*, 02×21, "Patterns of Force" (1968)**
Abrom: *Isak, what is all this?*
Isak: *Abrom! Abrom, thank God you're well. This is my brother. They were in the prison. Beaten as I was, Abrom.*
Abrom: *Why were you in their prison?*
Kirk: *I was trying to see the Fuhrer.*
Abrom: *The Fuhrer?*
Kirk: *If I can see him, there may be a way of stopping this insanity.*
Isak: *Abrom, I owe them my life.*
Abrom: *Isak, Uletta is dead. Shot down in the streets.*
Isak: *She would've been my wife.*

(continued)

Abrom: *She lived for five hours while they walked past her and spat on her. Our own people were unable to help her. Now you ask me to help strangers.*
Isak: *If we adopt the ways of the Nazis, we're as bad as the Nazis.*

***Star Trek: Deep Space Nine*, 05×10, "Rapture" (1996)**
Winn: *I'm going follow the path the Emissary has laid out for us.*
Kira: *It takes a lot of courage to admit you're wrong.*
Winn: *And you think I lack courage?*
Kira: *I didn't say that.*
Winn: *But it is what you think. Those of you who were in the Resistance, you're all the same. You think you're the only ones who fought the Cardassians, that you saved Bajor singlehandedly. Perhaps you forget, Major, the Cardassians arrested any Bajoran they found teaching the word of the Prophets. I was in a Cardassian prison camp for five years and I can remember each and every beating I suffered. And while you had your weapons to protect you, all I had was my faith and my courage. Walk with the Prophets, child. I know I will.*

Go and see which is the best trait for a person to acquire. Said Rabbi Eliezer: A good eye. Said Rabbi Joshua: A good friend. Said Rabbi Yossei: A good neighbor. Said Rabbi Shimon: To see what is born [out of one's actions]. Said Rabbi Elazar: A good heart. (*Ethics of the Fathers* (*Pirkei Avot*) [1])

Droxine: But what else can they understand, Mister Spock?
Spock: All the little things you and I understand and expect from life, such as equality, kindness, justice. (*TOS*, "The Cloud Minders" [2])

The Uses of Jewish Studies and *Star Trek*

Jewish Studies is concerned with history, theology, cultural studies, war and genocide studies and many other mechanisms of inquiry, insofar as they relate to the core element of Jewish experience. In the United States and Israel (and, to a lesser extent, in the United Kingdom), several universities offer dedicated Jewish Studies degree programs. Many additional universities without such programs do offer some courses on the subject. It speaks not only to Jewish university students (41% of whom, in a survey conducted in America in 2000, said they had taken such a course [3, p. 229]), [24] but also to broader audiences.

The richness of this dynamic and diverse culture's arts, its religious variegation, its body of thinkers and its unique position in historical settings from ancient Alexandria to modern Atlanta attract students to the subject. All of these qualities,

as well as the scholarly and common interest we afford any body of people, render this heterogeneous ethno-religious community a self-justifying subject of academic work. Jewish Studies additionally enables us to access the several disciplines it touches.

Due to the specific history and position of world Judaism, the material that Jewish Studies addresses can help us think about, and come to in part understand, the mechanics of diaspora. The American Jewish history of immigration, assimilation and cultural resistances to assimilation (from within this composite community and without) can yield insights into many immigrant populations' experiences. Jewish Studies can similarly help us try to reckon with the incomprehensible: dynamics of violent prejudice and genocide. Without some understanding of the subjects encompassed by Jewish Studies, we cannot meaningfully engage with modern Western history and the current geopolitical situation.

Similarly, Jewish Studies can also help us understand American history generally. According to Jeffrey Shandler, "[t]he United States offers the most extensive opportunities for studying Jewish popular culture. This is not simply due to the variety and quantity of examples, or to the fact that, in the past century, America became home to the world's largest and most stable Diaspora Jewish population" [4, p. 470]. It is because "Judaism [is] now celebrated as one of the nation's three great faiths, even though the Jews [make] up but 3.2 percent of the population." [3, p. 226] It is thus difficult to understand American culture and the nation's *zeitgeist* without grasping the nuanced position and perhaps outsized impact of Judaism thereupon. And given America's influence for good and ill on the world stage, many people both within and without that nation find themselves interested in attempting to understand it.

As Stefan Rabitsch has argued in another chapter of this volume (in the context of wider debates in media studies et al. about the value and necessity of studying popular culture), *Star Trek* has a great deal to say to us as 'literature'. It is equally a testament to, and was a cultural agent in, the eras in which it was produced. We can use *Star Trek* as a medium with which to teach media literacy as a transferable skillset. And as this volume as a whole demonstrates, like Jewish Studies itself, *Star Trek* can also provide us with a means of engaging with the wide variety of subjects it touches on—the subjects its various stories invite us to consider (or, in some cases, cause us to consider despite themselves).

Star Trek: The Original Series (*TOS*) was produced during a period when American Jewish identity was undergoing profound shifts. Jews were becoming less marginalized in American society, less persecuted, more upwardly-mobile, and more central to American national self-conceptions. Due to this timing, the people involved in its production, and the content of several of its episodes, *TOS* provides an excellent means of teaching this range of Jewish cultural figurations and historical experiences. This chapter will gloss that context and position the show's lead actors, Leonard Nimoy and William Shatner (both second-generation Ashkenazi/Eastern-European Jewish immigrants), in this framework. It will examine those actors' contributions in relation to discourses of community representation, alien otherness and passing, and explore both the acknowledged and subterranean ways their

performances were inflected by this identity. Some of the show's important early writers and producers were also Jewish, and these discourses of representation and passing also played out behind the scenes in ways that reverberated throughout the program. We will examine the show's textual attempts to reckon with the Shoah (or Holocaust)[1] in *TOS* episodes such as "The Conscience of the King" and "Patterns of Force". This period of assimilation was also an era in which the Shoah began to become a touchstone of American Jewish identity, during which those events were being reassessed and more broadly culturally cathected as trauma.

A Transitional Moment for American Jews

In its dealings with Jewishness, *Star Trek* fails and succeeds grandly, both as art and as an articulation of its professed progressive inclinations. In using *TOS* as a means of discussing a moment in Jewish experience, we can open up classroom conversations about how this era's changes gave rise to the US Diaspora's current 'Americanization'; how later *Star Trek* has negotiated this terrain and complicated these initial portrayals; and, more broadly, how media arises from and participates in shaping its time.

Though Jews had lived in North America since before the American Revolution, what we now think of as the American Jewish experience essentially began in the late nineteenth century, when a wave of Ashkenazi immigrants arrived fleeing pogroms in their old homelands and/or seeking economic opportunities in a new one. Like other uprooted new arrivals to America's crowded urban centres in this period, they faced privation and hardship [25]. Shandler observes that

> To a considerable degree, American Jewish popular culture is defined by the two million Jews who arrived at these shores from Eastern Europe during the period of mass immigration, lasting from the early 1880s to the start of World War I in 1914. These immigrants expanded the number of Jews in the United States exponentially, making their presence newly prominent in major American cities, especially New York. [...] The East European immigrant community and its descendants have dominated the public profile of Jews in the United States ever since [...]. Consequently, the public identity of future generations of American Jews has continued to be measured against these immigrants from Eastern Europe and their experiences. [4, p. 471]

These Ashkenazi immigrants developed flourishing Yiddish-language publishing (newspapers, poetry, etc.) and theatre cultures. The hopping pre- and inter-war Yiddish vaudeville [26] and comedy scenes birthed the Catskills circuit. This region

[1] A definitional note: "In the Bible, the Hebrew word 'shoah' connotes a sudden disaster or catastrophe. Thus, 'the Shoah' strikes many scholars as a more descriptively accurate term by which to refer to the persecution and murder of European Jewry between 1933 and 1945 than the more commonly used 'the Holocaust.' That word, of Greek origin, means 'a sacrifice (or offering) totally consumed by fire.' […] By virtue of being direct and unmetaphorical, 'the Shoah' avoids the sanctification of senseless killing that is implicit in the word 'holocaust.'" [5, p. 233]

of New York state contained modest resorts popular with Jewish families (who were often bared from gentile hotels, even if they could afford them). There was even a nascent Yiddish film industry.

American Jews integrated into the larger economy to a limited degree, but faced bars to their participation in several elite professions and quota-based discrimination at various institutions of higher learning. Neighborhood covenants prevented Jews who made it out of the slums from alighting within *them*. American anti-Semitism "was pervasive, prevalent, and deeply-rooted during the interwar years. [...] When asked in June 1944, as World War II was under way, to name "what nationality, religious or racial groups in this country are a menace," 24 percent of Americans surveyed named Jews; 9 percent named the Japanese." [3, p. 223]

Despite this, "World War II marked a watershed in American Jewish life. The murder of six million European Jews shifted, by default, the center of world Jewry to the five million Jews of the United States. In the ensuing decades, anti-Semitism waned, and the nation voiced enthusiasm for its Judo-Christian heritage." [3, p. 225] National prosperity, Jewish service in World War II, and Truman-era legislation outlawing racism in hiring and higher education enabled Jews to be accepted and successful in America. It was Jewish cultural achievements, however, from Yiddish loan-words to Phillip Roth books and Woody Allen movies, that, over time, positioned Judaism as part of the "triumvirate of the nation's major faiths". [3, p. 225] Secular and non-secular Jewishness became an important component of American self-conceptions of national identity. This is in keeping with the contested 'melting pot' rhetoric liberal American multicultural discourses routinely deploy: the whole takes on elements of the character of its components.

Jewish Bodies, Jewish Characters?

And speaking of 'melting pots', what is popularly considered more all-American than *Star Trek*? This public perception arises both despite and because of the program's internationalist leanings and diverse cast. Perhaps Kirk functioned for some viewers as a WASP[2]-reading anchor leading a crew of 'diversity picks', representing how well this lot could do 'when led by white officers'. Perhaps the show depicted a diverse, ascendant Federation-America, but safely contained that diversity by subordinating, by means of military discipline in pursuit of Higher Causes, the different to a presumed-dominant European hierarchy in the person of Kirk [27]. But reading Kirk is actually more complicated than that, in part due to issues of embodiment: *both* lead actors in *TOS*[3] were the sons of Ashkenazi Jews who'd fled Eastern Europe. According to Shatner, he and Nimoy both grew up "in kosher homes, with three sets of dishes, presumably one meat, one milk and one for Passover, and they both were 'called all the anti-Semitic names [...].

[2] An acronym for 'white Anglo-Saxon protestant'.

[3] Additionally, "[Walter] Koenig's parents were Russian Jews who had emigrated from Lithuania" [6].

Experiences like that create a sort of subtext, and as we got to know each other, those common experiences helped bind us together. It's almost an emotional shorthand.'" [6]

Nimoy's Jewishness in particular can operate as an additional layer of meaning for those who recognize it (often as an act of self-recognition) in the half-human, half-Vulcan Spock, and thus parse Nimoy and/or Spock as representational. If Nimoy as an actor's body or deportment signaled otherness, Spock as a character also clearly signaled his minority status in a way that 'read' in American political terms. "Many minorities empathized with Spock and identified him as one of their own. A young biracial girl wrote to Spock through a fan magazine [and] Nimoy was so moved by the letter that he responded to her, as Spock, in the following issue". [6]

Of the two leads, Nimoy was (and is) more often read as non-WASP. Nimoy's 'non-standard' body was able, with the aid of minimal 'China Yellow' makeup and prosthetic ears, to code him as (half) alien. Naturally there is a production rationale for this minimalism.[4] Even so, it is striking that in a world where alienness is often signaled by extreme physical difference—Andorians, the Gorn, the Horta—Spock's 'alien characteristic' is, yes, his ears, but *moreover* the 'otherness' inherent in his looks and bearing. Nimoy's 'raced' body becomes the site and communicator of Spock's otherness. Additionally, in making Spock 'not entirely human', *Star Trek* makes him half Vulcan. This gives him something else—something equal to, or, in some ways, something even better than human—to be. Traditionally, the 'not-fully-human' quality ascribed to a raced body like Nimoy's was nothing like positive.

The episode "The Galileo Seven" [7], however, by Jewish writer Shimon Wincelberg, is less optimistic, and features Spock indeed being treated as 'less than human'. In this viscerally uncomfortable story, Spock is thoroughly undermined by humans who refuse to trust him or behave professionally under his temporary command on a fairly standard away-mission-gone-very-wrong. These members of Starfleet forget themselves (and their training, we must assume) and behave mutinously, explicitly because Spock is culturally different from them, as demonstrated by his divergent attitudes on such socially-constructed and religiously-coded subjects as the treatment of corpses. Spock is thus marginalized in realistic and contemporary ways.

Spock is not only non-human, he also lives outside the culture he was raised in. As his human mother Amanda suggests in "Journey to Babel" [8], due to his mixed heritage Spock feels at home nowhere. Nimoy himself was far from his family and home while *TOS* was being shot. During filming, Nimoy so missed Yiddish that he

[4] It would have been difficult for Nimoy to work for years in a cumbersome get-up. This character design would also have been time-consuming to maintain (and thus expensive for the studio). Such factors also need to be borne in mind when we make generally valid criticisms of the Federation's apparent pro-human biases. By *Star Trek: The Next Generation* (*TNG*), producers trusted *Star Trek* as a property sufficiently to make frankly Herculean production efforts for Brent Spiner and Michael Dorn's characters. But circa *TOS*, no one yet understood that *Star Trek* would become *Star Trek*, a property that would pay dividends on such storytelling investments. For a similar case of logistics limiting a televisual depiction of alien otherness, see the production-level revisions to *Blakes 7*'s Cally.

found a psychologist with a similar background, paid her for her time, and simply spoke to her regularly in their shared language [9][5].

As a creation of Nimoy's and as a character considered more fully, Spock is perhaps most Jewish in his 'failure' to fully integrate and be completely happy. After all, it is a truth universally acknowledged that the quintessential affects of Jewish experience are the unease attendant on displacement and/or perpetually being in the minority, and longing. Traditionally, one longed for lost Israel, and for the destroyed Temple. The Wailing Wall, one of the central devotional objects in Jewish thought, is an incomplete and ruined monument not just to the holy place in question but also to the abiding memory of its loss. The site has since become cathected with the memories of other losses—I am writing this essay on Tisha B'Av, a fast day that originally commemorated the destruction of the first and second temple. The wall and day alike are now also charged with carrying the memory of subsequent disasters to befall Jews, including hard-hitting Soviet purges and the Shoah.

Spock goes through the world contained, but when his emotional control is fractured (in "The Naked Time" [10], for example), he grapples with a sadness that, despite the consolations of logic, apparently lies close to the surface. Despite how immensely poorly the development was handled, it almost made sense for the 2009 reboot film to destroy Vulcan, because in a way Vulcan was always inaccessible, longed-for and lost. It seems narratively impossible for Spock to live at home on Vulcan, happily settled rather than positioned as something of a 'wandering Jew'. *Star Trek: The Motion Picture* (*ST:I*) makes this explicit [11]. Spock fails to complete the final ritual of *kolinahr* and returns to the *Enterprise*. Even as an old man in *TNG* we see Ambassador Spock living in self-imposed exile on Romulus, separated from his closest friends and sundered from his patrimony (leaving Picard, like the wrong brother, to receive Sarek's dying blessing and pass it on) [12].

But if Spock's Jewishness influences the character's melancholy core, it is also a driving force behind some of Spock's most iconic, beloved and affirming contributions to culture. Nimoy based the famous Vulcan salute "on the raising of the hands during the [Jewish] priestly blessing. This invocation of the priestly sign was deliberate, something [Nimoy] remembered from peeking at the priestly blessing in shul when he was a child, though the congregation is meant to look away from those performing priestly blessing" [6]. There is likewise a certain similarity between the Vulcan call and response 'live long and prosper'/'peace and long life' and the traditional Hebrew blessing 'shalom aleichem (peace be upon you)'/'aleichem shalom (upon you be peace)'.

If Nimoy reads as Other and representationally Jewish, then Shatner 'passes', and is effectually the New Jew, completely and even representatively "all-American [in] name and character" [6]. Yet as with Nimoy, for 'those in the know', Shatner's

[5] In an alternate timeline in which Yiddish theatre culture still thrived as before the war, Nimoy, who had "a brief stint working with famous Yiddish theatre maven Maurice Schwartz" [9], might well have been claimed by Jewish theatre, even as Jews now claim him as one of their own. But, in keeping with our discussion of a defining nostalgia, this was not to be: Yiddish theatre is a lost art, formerly conducted in a now-dying language, by and for a now-lost world.

Kirk can simultaneously be read as Jewish. After all, who knows better than other Jews what a crock 'funny, she doesn't look Jewish!' (a cliché Mel Brooks mocked in his sf parody *Space Balls* (1987) [13]) can be?

There are a range of recognizable American Jewish performance styles, most of which are rooted, as Shandler indicated above, in the legacy of the Askenazi community. I speak here not only of 'formal' performance modes associated with Catskills Jewish comedy, vaudeville and Yiddish theatre (etc.), but also of modes of voiced and embodied affect associated with the performance *of Jewishness* (a performative mode functioning something like Judith Butler's formulation of gender does). If cultural affiliations are performative, then Shatner at times brings his own to Kirk—perhaps unwittingly, perhaps slyly. In his eclectic book *Jewish Themes in Star Trek*, Rabbi Yonassan Gershom observes that "*Star Trek* is full of Jewish references and in-jokes. Most American Jews pick up on them. On the other hand, these same references go right over the heads of native-born Israelis. Why? Because most Israelis don't know the Yiddish idioms upon which they are based" [14]. Shatner's at times vehement physical performances and 'stilted' line deliveries strike me not only as strongly rooted in his Olivier–era Shakespearian background[6], but also as somewhat reliant on the emphatic gestures and 'stilted' speech patterns of the community to which he belongs.

A linguist could, I think, tease out an affinity between Shatner's falling initial syllables and his successive pause-and-pick-up (more prominent in later seasons, as he settled into the role) and the 'you *want* I should *what?*' rhythm of Yiddish speakers communicating via American English. Even Shatner's tendency to let sentences fall as rhetorical questions often seems to append an invisible 'nu?' [28] to the end of his phrases. Given Shatner's background, it would be remarkable if, at least as a young man, he was not thoroughly permeated by the linguistic habits of his family and community and prone to replicating them (without necessarily realizing as much).

The episode "A Piece of the Action" [15] sees Spock and Kirk cheerfully kvetching (moaning and arguing) about Kirk's driving, coming off like an old buby and zedey (Jewish grandmother and grandfather). Kirk's card-game bluffing and his physical position in the final frame are pure Zero Mostel—these scenes play like something out of Mel Brooks' *The Producers* (1968) [16].

Kirk's comedic timing, a hugely important element of Shatner's performance, often feels derived from a Jewish tradition. Freud characterized Jewish humor as uniquely self-deprecating [17, p. 64 f.], and Kirk delivers many of his jokes with a gently wry turn. This is quite at odds with the current popular perception of Kirk as a swaggering, grotesquely confident Zapp Brannigan figure. This retroactive reimagining of the character exaggerates Kirk's performative, contemporary (i.e. twenty-first century) masculinity, simultaneously stripping out these ethnic undercurrents.[7] Gershom also points out that Kirk's naches-laden (smugly proud) final

[6] This could be a paper in and of itself, but as a brief point, note his treatment of iambs.

[7] Among other referents, such as Hornblower, Kirk's acknowledged nautical-fiction predecessor [18].

lines in "The Changeling" [19] are (particularly their delivery, I think) "a classic Jewish joke!"

Kirk: Well, it thought I was its mother, didn't it? Do you think I'm completely without feelings, Mister Spock? You saw what it did for Scotty. What a doctor it would've made. My son, the doctor. Kind of gets you right there, doesn't it?

Beyond Embodiment: Jewish Stories in *Star Trek*

If we step back from the leads, we can consider the whole project of *TOS*. The show has at times been billed as a Space Western, chronicling the exploration and expansion of the "final frontier". This perhaps ought to be read in light of the actual 'pioneer settlement' occurring contemporaneously: the contested colonial project of making the Israeli desert bloom. This was not a minor development in the American political consciousness. In the wake of World War II, Jewish Americans advocated Zionism as a response to the Shoah and advanced funds and aid towards this goal, sometimes emigrating themselves. The 1958 book and 1960 film *Exodus* chronicled the foundation of the Israeli nation state, and they were very popular with non-Jewish Americans. "*Exodus* became an international publishing phenomenon, the biggest bestseller in the United States since *Gone with the Wind*. [The writer] sold the film rights in advance" [20].

Exodus's narrative of settlement relied somewhat on the already-familiar and popular framework of the Western (paralleling the 'new' nation of Israel with early America—the Jews are just like us!) for its American appeal. *Exodus* also presented a heroic and *current* narrative of 'the frontier' that was then coded as socially progressive. (Though all three frontiers in play—the West, Israel and space—were of course already peopled with culturally, racially Other inhabitants.) Thus to an extent not now readily accessible to us, *TOS* was being read in light of this slightly-antecedent Jewish political story that, like *TOS*, 'adapted' the Western framework. This gave *TOS* a sort of implied, structural Jewish association.

Like *Exodus* and the events that book was based on, *TOS* at times represents an attempt to respond to the Shoah. The force the Shoah now exerts on the American political consciousness has obscured the more ambivalent history of America's relationship with these events. Immediately after the war's conclusion, Peter Heyes tells us that "survivors often encountered insensitivity about what they had been through and lack of interest" [5, p. 254]. He notes "the oft-repeated view that silence enveloped the story of the Shoah in the 1950s and 1960s", and states that

> the enormity and extent of the destruction wrought by World War II tended to blot out the particular horrors visited on the Jews. It was only when the Shoah emerged as a cinematic theme at the beginning of the 1960s (*The Diary of Anne Frank* in 1959, *Exodus* in 1960, *Judgment at Nuremberg* in 1961, *The Pawnbroker* in 1965), and then the great breakthrough into public consciousness of the TV drama *Holocaust* in 1978, that survivors in North America felt empowered to reflect on their experience in public and were assured of an attentive audience. [5, p. 254]

The Shoah only became 'the Holocaust' ("a term not yet in use" in the 1950s [5, p. 226]) —only *became* a "pillar of American Jewish identity" [3, p. 229] and a key part of Americans' visions of morality and political possibility—after time, after processing, and via art. The media and ideological entity of the Shoah is a construction of popular consciousness (even as the actual genocide is an indelible mark against the popular consciousness that enabled it).

Star Trek's negotiations of the Shoah therefore stem from a very specific, dynamic period—a period when the weight and meaning of these events was contested and shifting. For example, in 1968 it was possible to ask Jewish actors to dress up as soldiers of a regime that had slaughtered their people, including members of Nimoy's extended family [6], for a bit of a romp—like an unironic "Springtime for Hitler" [16].

In that episode, the well-meaning but ultimately ham-fisted "Patterns of Force" [21], the *Enterprise* comes to the planet Ekos to retrieve Gill, a Federation citizen and former friend of Kirk's who has gone missing. We later learn this over-ambitious academic decided to 'help the Ekosians' development' (somehow or other, it is never clear) by introducing Nazism.

> Kirk: Gill. Gill, why did you abandon your mission? Why did you interfere with this culture?
> Gill: Planet fragmented. Divided. Took lesson from Earth history.
> Kirk: But why Nazi Germany? You studied history. You knew what the Nazis were.
> Gill: Most efficient state Earth ever knew.
> Spock: Quite true, Captain. That tiny country, beaten, bankrupt, defeated, rose in a few years to stand only one step away from global domination.
> Kirk: But it was brutal, perverted, had to be destroyed at a terrible cost. Why that example?
> Spock: Perhaps Gill felt that such a state, run benignly, could accomplish its efficiency without sadism.

Gill had not counted on a replica of an expansionist, hate-fueled, dynamic regime getting out of hand and replicating the aspects of its original he found undesirable—in this case, engaging in a mass racial culling of the state's pacifist, heavily Jewish-coded Zeon immigrants. The parallels are not particularly subtly drawn. Throughout this episode, Spock is coded as visibly different (nominally due to his ears, but people find him suspicious before the helmet comes off), and possibly Zeon: visibly so. We are even treated to a quick mocking of eugenics via a run-down of Spock's supposed deficiencies. 'Zeon' is of course a breath away from 'Zion', and the immigrants have personal names (Abrom, Isak, etc.) to match. Rabbi Gershom makes a fair argument that this episode is actually equally concerned with the then-contemporary Six Day War (1967). While I think that reading ought to be considered, I am here concerned with the episode's more glaringly-obvious allegorical content.

Hayes notes that rather than being extraordinarily competent (a belief this episode forces Spock to espouse), numerous commentators believe the Nazi's "allocation of German personnel and resources to the murder process [involved in the Shoah]" was performed at a huge "military cost to Germany" and "stripped the

Reich of people and often skills it could ill afford to lose" [5, p. 247 f.]. Nor does the manner of those killings speak of great efficiency. "[T]he killing installations were usually ramshackle and primitive [...] the camp more closely resembled a stockyard and slaughterhouse than it did an automated "death factory".

We often give fascism this sort of retroactive shine: at least Mussolini made the trains run on time (except for how he never did). Such thinking is not only blatantly inaccurate, it is also a particularly dangerous form of nostalgia that privileges power fantasies over reason, let alone decency. In our current political moment, with neo-Fascism and neo-anti-Semitism on the rise globally, it should be only too clear what this kind of thinking can lead to. Yet it is thinking which reoccurs, which academics must thus seek to understand, and to help others to understand and see through.

"The City on the Edge of Forever" [22], written by Jewish author Harlan Ellison, positions the Nazis less ambivalently. In this episode, a change in the timeline in the 1930s enables a Nazi victory. Spock asserts that as a consequence of greater Nazi martial success, "millions [of additional people] will die". He does not point out any upsides to that. In "City", the Nazi regime is a threat to human survival and the progress that enables the *Enterprise* to travel the stars. The change in the timeline seems to wipe out the *Enterprise* itself.

TOS's most sophisticated treatment of the Shoah is also its most veiled. "The Conscience of the King" [23] nominally concerns a genocide on Tarsus IV which Kirk escaped as a child. Kirk is one of the few surviving witnesses to the killings. The episode explores trauma, vengeance, the effects of time on both and the possibility of absolution as Kirk debates whether an aged actor is actually the dictator he watched execute thousands of people, and what to do about it if he is.

"Conscience" was broadcast not long after the 1962 trial and execution of Shoah-organizer Adolf Eichmann, brought about by Mossad, the Israeli foreign intelligence service. Mossad also killed Herberts Cukurs, the "Butcher of Riga" (note the appellation's similarity to "Kodos the Executioner") in 1965. These efforts were very much in the public eye. Mossad's work has long provoked moral debates about justice, punishment, personal guilt and communal memory (especially as Mossad's targets aged). The story uses several Shakespeare plays to explore these dilemmas, and to triangulate the relationship between Kodos, his daughter, Kirk, and Kirk's subordinate Riley[8]. Riley is another member of the small clutch of surviving witnesses. Kodos's daughter has been killing off these witnesses in order to protect her father from detection. She is perhaps Kodos's most deeply-traumatized living victim: a young woman haunted by the violence of her past and compelled to reenact it, along with her Electra complex, on stage and off.

Kirk's survival of a genocide event and this positioning of him as an avenger again code him as ambivalently Jewish. If "Patterns" shows the 1950s and 1960s' consignment of the Shoah to oblivion, then "City on the Edge" is more sensitive to the particular gravity of the circumstances, and "Conscience" remains a fine and nuanced attempt to grapple with one aspect of the legacy of the Shoah, which offers few easy answers.

[8] Whom you may remember from "The Naked Time"—he'll take you home again, Kathleen.

Boldly Going Further: Towards Future Work On *Star Trek* and Jewish Studies

Engaging with Jewish Studies via *TOS* would be far more than an exercise in herding together references. *Star Trek* is a productive framework via which to convey this history. Further, by examining *Star Trek* in light of Jewish Studies we can talk to students about evolving histories of representation, and of television making. We can help students hone their media analysis and critical skills by delving deeply into the complex relationship between this subject and this text. Grappling with something as vast and complicated as the question of how we can or should convey genocide and weighing the mechanisms that have been used to do so can be overwhelming in any context. By isolating and interrogating the quite specific examples *TOS* gives us we have both a discrete focal point and more than enough to start talking about, even before we look at the wider *Star Trek* universe.

The *TOS* material herein could generate several lectures, assignments and discussions (we have not even touched on race and Doctor McCoy). Beyond that, a class might spend a whole year looking at what *Star Trek: The Next Generation* (*TNG*), *Star Trek: Deep Space Nine* (*DS9*), the reboot films, etcetera, have to say about their periods and changing conceptions of Jewishness, alone or in concert with other, intersectional axes of interest. Thinking about the Ferengi, the Bajorans and the Dominion War in this light could be immensely generative [29]. The narrative role genocide plays in the reboot universe, for example, could be interrogated on craft and representational axes.

It is always difficult to convey the historical contingency of political opinion, or of artistic strategies. It is also often difficult to find a means by which to enter into modern Jewish history and topics. *Star Trek* is a useful and engaging way into the subject. Finally, Jewish issues are important components of several *Star Trek* narratives, and we can better understand *Star Trek* itself with the aid of this lens.

Over the years, *Star Trek* has presented Jewishness both compellingly and awfully. It has an ambivalent track record both in terms of reckoning with the ideas involved and in terms of presenting them. But again, if "Patterns" is one of *TOS*'s weakest episodes, then "Conscience" is one of its best: as art, as entertainment, and ultimately as an attempt to live up to the program's first, best destiny. By that I mean that ideally and quintessentially (the show's American liberal hang-ups taken in stride), *Star Trek* is a progressive, cosmopolitan, thoughtfully-written program and universe, as concerned with the future of human (and alien) relations as it is with the future of technology. *Star Trek* tells good stories about people trying to be good. *Star Trek* thinks the difficult effort of trying to convey life well-lived is worth its time, and yours. It has often managed this beautifully, and there is a certain resonance between the two epigrams that began this piece: between the conversation among rabbis about what it is to live well and Spock's encapsulation of the program's fundamental values. And from the production level to the narrative, Jewish stories have been an important part of this proud tradition.

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Recommended Reading

24. I have quoted extensively from the afore-cited *Cambridge Guide to Jewish History, Religion and Culture*. This volume of essays would serve as a good entry point for students and educators interested in incorporating Jewish perspectives in their courses. If anyone wishes to brush up on the Third Wave of American immigration, during which the American Jewish community (in its current form) took shape, they might receive helpful grounding from George Tindall and David Shi's foundational *America: A Narrative History*. It will also familiarize readers with the American historiographic framing of this period.
25. Anzia Yezierska's 1925 novel *Bread Givers*, *An American Tail* (film, 1986), or the opening speech from Kushner's "Angels in America" might provide students insight into both these events and their reception history.
26. Clips of *Funny Girl* (film, 1969) may help illustrate this. Note that Brooks, Streisand, etc. are producing Jewish-interest films roughly contemporaneously with *TOS*.
27. For more on the American turn of the Federation, see Martin Gabriel, *How to name a Starship: Starfleet between Anglo-American Bias and the Ideals of Humanism*, another chapter in this volume.
28. An explanation of 'nu' can be found here: Wex, M. (2008). "Just Say 'Nu?': Nu!". *The Forward*, http://forward.com/culture/12736/just-say-nu-01335/ (retrieved July 26, 2017).
29. *The Cambridge Guide* has relevant chapters on modern Israel and the Arab-Israeli conflict, as well as on Jewish mysticism.

"Wagon Wheels, Sails, and Warp Cores": *Star Trek* and American Culture: Between Allegory and Worldbuilding

Stefan Rabitsch

Abstract

Science fiction (sf) stories, like other forms of popular culture, are interwoven with the historical moment(s) that produced them. Once we have acquired the reading/viewing protocols that allow us to adjust for the 'estranging/estranged' distortions of sf, we recognize more clearly the cultural imprints of the language, images, and values that such stories bear. As popular culture mirrors, they can provide creative access points for ascertaining and understanding the *zeitgeist* that brought them forth. Both the conception and the first run of *Star Trek: The Original Series* (1966–1969) provide reflections and refractions of American culture at a time when it witnessed major international transitions and domestic upheaval. Bearing a recognizable imprint of the post-war optimism and confidence in scientific progress, *Star Trek*'s premise of telling modern morality plays gives us access to that which Americans were hopeful and/or concerned about. *Star Trek* was also minted with the American self-image of being the protector and defender of the western world, its values and its achievements. By viewing John F. Kennedy's presidency vis-à-vis *Star Trek*, we will see how the US, as a self-styled conqueror of a continent, began to integrate the 'benevolent' mission of its ideological predecessor, the British Empire, into its own national mythos.

Keywords

American culture · Cultural thinking · 1960s · Science fiction · Allegory · Westerns · Kennedy · Wagon Train · Hornblower

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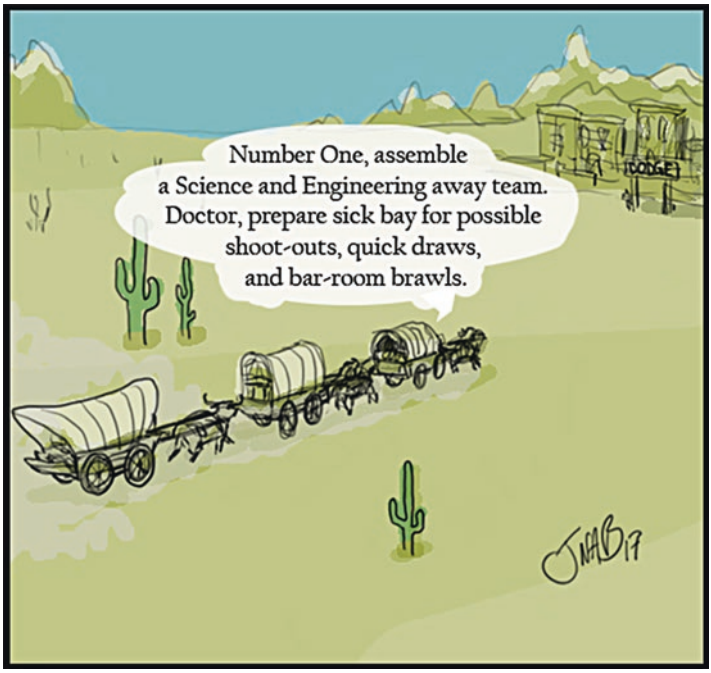

Editors' Log: Chapter 3

In the very first *Star Trek* episode that aired on television (September 8, 1966), an alien species, which had become almost extinct, is compared to the American bison. Such references seem fitting for a TV show that is often described as a space western. The first words we hear in that episode, however, are those of Captain James T. Kirk, recording his captain's log. He introduces audiences to an adventure reminiscent of seaborne voyages of the past. Academic Trekkie Stefan Rabitsch teaches American Studies with a focus on Science Fiction. In the following chapter, he makes clear that the heart of *Star Trek*'s world is a heart that actually beats to the rhythm of two cultural spheres – the United States and Britain – their history, their national mythology, and their worldview. (**Eds.)**

***Star Trek: The Original Series*, 01×05, "The Man Trap" (1966)**
Kirk: *The last of her kind?*
Crater: *The last of its kind. Earth history, remember? Like the passenger pigeon or buffalo. […]*
Spock: *The Earth buffalo. What about it?*

(continued)

Crater: *Once there were millions of them, prairies black with them. One herd covered three whole states, and when they moved they were like thunder.*
Spock: *And now they're gone. Is that what you mean?*
Crater: *Like the creatures here. Once there were millions of them. Now there's one left.*

***Star Trek: The Original Series*, 02×24, "The Ultimate Computer" (1968)**
Kirk: *Do you know the one, 'All I ask is a tall ship'?*
McCoy: *It's a line from a poem. A very old poem, isn't it?*
Kirk: *20th century Earth. 'All I ask is a tall ship, and a star to steer by'. You could feel the wind at your back in those days. The sounds of the sea beneath you. And even if you take away the wind and the water, it's still the same. The ship is yours. You can feel her. And the stars are still there, Bones.*

Introduction – Recognizing the Known Unknown

Imagine. It is the 1960s, and an American family gathers around the TV set in their living room. Television had become the fastest growing source of information and entertainment. It brought worlds, real and imaginary, into millions of homes. Between 1966 and 1969, the program also included the adventures of Captain Kirk (William Shatner) and his intrepid crew onboard the starship *Enterprise*. Set in the twenty-third century, they were on a mission of discovery.

One week in 1967, their mission leads the *Enterprise* crew to a planet that has been engaged in a virtual war with its neighbor for 500 years. Instead of using real weapons, which would bring destruction to the great works of both civilizations, the two enemies calculate targets by way of computers. Once a successful hit is recorded, citizens willingly report to disintegration chambers to become casualties of war. The *Enterprise* and its crew also become a target. Captain Kirk, however, refuses to surrender and subsequently sabotages the planet's virtual war machines, giving them "back the horrors of war" [1]. The senselessness of this 'hot' Cold War was bound to strike a nerve with American audiences for whom the Cuban Missile Crisis of 1962 was a vivid memory. The episode fed off the perpetual anxiety of living under the doctrine of Mutually Assured Destruction (MAD) that kept the balance of power between the United States and the Soviet Union.

Another week goes by and the starship crew takes part in an experiment whose goal it is to increase ship efficiency. Automating shipboard functions, a super computer should help to limit the risk to human life. The experiment goes awry when the M-5 computer attacks friendly starships. At the last moment, it is shut down, prompting Mr. Spock (Leonard Nimoy) to observe that "computers are more efficient than human beings, not better." The episode was aired amidst the promise and potential that automatization efforts had brought to American industry during the

post-war years. Speaking to the dehumanization and obsolescence increasingly felt by American workers, Doctor McCoy (DeForest Kelley) sarcastically remarks "[w]e are all sorry for the other guy when he loses a job to a machine" [2].

In yet another episode, the captain and a disguised survey party visit a pre-industrial culture on a planet they had studied years earlier. To their surprise and shock, they become embroiled in a conflict where one village, using advanced flint-lock rifles, visits death and destruction upon another village whose warriors are equipped only with bows and arrows. The crew discovers that the Klingons, a competing empire, supplied these weapons to this one group of 'natives' in an effort to gain control over the planet's vital resources. Failing to find another solution, the episode ends with Captain Kirk creating a "balance of power" by furnishing the other village with a hundred rifles – a hundred "serpents for the Garden of Eden." The uncanny parallels between this episode and the ongoing Vietnam War could not have gone unnoticed. After all, the Vietcong and the North Vietnamese were supplied by the Soviet Union and China, while the United States both supplied and intervened on behalf of Anti-Communist South Vietnam. It was one of these "20th century brush wars" [3] that are reflected in the episode. While these proxy wars speak to America's Neo-Imperialism in the twentieth century, the episode simultaneously reflects the practices of the old colonial empires whose 'benevolence' brought the fruits of western civilization to the 'savage' corners of the globe.

In the next season, the *Enterprise* encounters two dichromatic aliens who are the only remaining survivors of a fierce race war. Each tries to make their case to the crew that they are inherently different simply because the right half of one alien's body is black while the left half is white, and vice versa. They hijack the ship and return to their planet which is desolate and devoid of life. As they keep chasing and fighting each other on the surface, the final scenes are interspersed with footage of burning buildings and destroyed storefronts [4]. The same TV screens that brought this episode into American living rooms, also broadcast eerily similar images of race riots that swept through cities like Chicago, Detroit, and Los Angeles as the Civil Rights Movement marched towards ending racial inequality.

In yet another episode, the starship crew apprehends a colorful and free-spirited group of political renegades. Suspicious of the government and opposed to its values, they rejected life in the Federation. Following their leader, they hijack the ship and make their way to the planet Eden. There, they intend to pursue their vision of a non-conformist and anti-technological life. The promised fruits of Eden, however, remain forbidden as the planet's very environment turns out to be lethal. Aired after the Summer of Love in 1967, this *Star Trek* story offered a strong comment against the counter-cultural revolution – the 'space hippies' fail in their quest [5].

Even though made strange by the language, symbols, and techniques of science fiction (sf), in recognizing these seemingly uncanny parallels, we recognize the power of sf storytelling and the premise of *Star Trek*. A product of American cultural contexts of the late 1950s and 1960s, *Star Trek: The Original Series* (*TOS*) serves as a popular culture mirror of the times. Looking through its allegorical reflections, we can understand the historical and cultural forces that informed *Star Trek*'s conception. Not only is *Star Trek* complicit in American ideology, but since

its stories are science fiction, *Star Trek* also becomes a means of viewing critically American culture from an intellectually stimulating vantage point. While a product of historical circumstances specific to its point of origin, the *Star Trek* formula was such that it could be adapted to changing contexts. Consequently, each incarnation of *Star Trek* can be used as a lens for looking at contemporary American cultural issues and/or American responses to concerns that are of a universal nature.

What If? – The Workings of sf

As a mode of fantastic storytelling, sf essentially asks a simple yet thought-provoking question: *what if?* What if alien beings made contact with us tomorrow? What if all electronics seized to function from one day to the next? What if we developed means of prolonging our lifespans indefinitely? What if a drug-resistant super bug decimated the world's population in the course of a few weeks? What if a series of severe climate catastrophes destroyed the pillars of our postindustrial global economy? Sf stories then go ahead and speculate about how we as human beings would react in those imagined scenarios – how our values, our behaviors, and our actions would change, or not change for that matter. Sf stories engage in this process of extrapolation by abusing the language and symbols of science and reason. A 'what if'-scenario essentially amounts to a proposition that asks readers/viewers/gamers to suspend their disbelief by simulating – not by practicing – the basic tenets of the scientific method.

By introducing that which is weird, strange and/or as yet unknown, sf stories trigger a cognitive shift that creates a world alternative to our empirical reality, i.e. our everyday life. Such a shift can go forward or backward in time; it can also lead to an alternative present or any other reality divergent from our own. We are then invited to *think along* as scientifically *plausible* scenarios play out in these imaginary worlds. Unlike other fantastic story modes, like fantasy and horror, sf abuses the language of science to explain its own sense of wonder. Sf makes the fantastic appear scientifically plausible within the confines of the imaginary worlds it creates. In short, sf writes its own rules, explains their workings to us, and then mostly plays along these same rules.

These worlds, however, must still stand in a discoverable and recognizable relationship to our empirical reality lest their meaning is lost. Harnessing the power of metaphor, this is made difficult by maneuvers of distorting, disguising and/or displacing the known into the seemingly unknown of imaginary worlds. Language is the main means for achieving estrangement. While there are many new words describing sf's wonders – so-called *neologisms* – they are still vastly outnumbered by the distorting use of mundane language. A *starship* makes for a good example. As a *species*, a starship, which can travel faster than the speed of light, is both unknown and unavailable to us. Hence, it is a fantastic albeit not implausible entity. However, a starship also belongs to the *genus* 'ship' which increases its degree of familiarity and recognition in relation to our knowledge of ships of the past and the present. The large majority of sf stories employ many of these maneuvers

simultaneously which, of course, increases the complexity of their estrangement. Even so, 'what if'-scenarios always bear an imprint of the historical moment that brought them forth and/or any historical moments that preceded them.

For example, H. G. Wells's alien invasion narrative *The War of the Worlds* (1898), reflects Britain's anxieties over the gradual erosion of imperial control and its fear of the imperial fringes striking back at the imperial center. Prompted by the radioactive fallout of the Castle Bravo detonation[1] in 1954, Nevil Shute's post-apocalyptic novel *On the Beach* (1957) took the psychological pulse of the western world perpetually afraid of a nuclear Third World War. In the same vein, a *TOS* episode like "The Mark of Gideon" was reflective of the widespread fears of overpopulation and the neo-Malthusian debate that had fueled the burgeoning environmental movement since the mid-1950s. The crew visits a planet whose germ-free atmosphere resulted in the extremely long lifespan of its inhabitants. Since they do not keep their birthrate in check due to their "love of life" [6], what was once a paradise, has become a living hell; Paul Ehrlich's influential book *The Population Bomb* (1968) had been published less than a year before the episode aired.

Scientifically plausible estrangement also lays bare the democratizing spirit, the allegorical intentions, and the educational potential that are deeply rooted in sf. They can be traced back to various points long before the genre label 'science fiction' was coined. Mary Shelley's proto-sf novel *Frankenstein; or, The Modern Prometheus* (1818) is a paradigmatic example. It asks the question of what if we were able to (re)create life by combining scientific knowledge with the means of industrial production? It is not a story about a monster; it is a story about *human hubris*. It casts into imaginary terms the contemporary meeting between the forces of the Scientific and Industrial Revolutions with the intuition and reactionary anxieties of literary Romanticism. As such, it reflects our sexualized fascination with our own genius as a species and the products thereof which has set the base tone of western techno-science ever since. Simultaneously, it resonates with our existential fears of what might happen when we overreach our self-imposed limitations. In a similar vein, *Star Trek*'s 'what if'-proposition gives us access to the powerful national rhetoric and national myths, which together with large-scale shifts of geopolitical power, shaped the American *zeitgeist* of the 1960s. They also had a lasting impact on the *Star Trek* formula.

Star Trek's sf proposition is already inherent in its title. Its sf world imagines a future where humanity is on *a trek to the stars*. It asks, what if humanity develops the means of traversing interstellar space and thus makes contact with alien life? When Gene Roddenberry pitched the concept for his TV show to studio executives, he further specified his idea by way of two intertextual reference points. *Star Trek*

[1] Castle Bravo refers to the most powerful nuclear detonation test ever conducted by the United States. Initially classified, the unexpected strength of the detonation and the subsequent fallout over a large area in the Pacific sparked international concern and controversy.

would be like 'Wagon Train[2] to the stars' and 'Hornblower[3] in space'. It is these two intertextual references that provide us with the mechanism for taking the pulse of American culture at the time of *Star Trek*'s conception and its first run.

Allegory – Westerns, Kennedy and the New Frontier of the 1960s

As 'Wagon Train to the stars', *Star Trek* was essentially pitched and sold as being little more than a space western; a science-fictional format where ray guns and space ships would replace six shooters and horses. However, *Star Trek* was not really a space western. Even so, by disguising it as one, *Star Trek* became marketable at a time when the Western had been reigning supreme on the American media landscape for over two decades. The popularity of the genre reflected the domestic and international optimism of Americans and their belief in the special role of the United States. The Western celebrated the good of American leadership while, at the same time, it provided a means for coping with challenges and fears that threatened to impede Americans' providential role. The genre was the product of a national-identity-defining chapter in American history, i.e. the Westward expansion in the nineteenth century. Once the geographic West had supposedly been settled by the beginning of the twentieth century, the Western offered a fictional continuation of this national mythos *ad infinitum* – first in literary form and in affordable pulp magazines, and later then in film and on television.

The mythos of the American West is a story of untrammeled national progress and exceptionalism. It attests to Americans' belief in their Manifest Destiny, i.e. their privileged position and special mission to lead western civilization by example. Out West, American civilization met the 'savage' world of the wilderness in a transformative space that became known as the *frontier*. In this space, wilderness was turned into civilization by way of the superiority of American ingenuity, enterprise, and democracy. Through this transformational struggle, the US national project and its democratic foundations would arguably renew themselves and thus stay healthy. Essentially an imagined space, the frontier was both elusive and ironic; as soon as civilization had reached the frontier, the latter moved further west making it necessary for the process to be repeated over and over again.

The Western continued America's mythos of frontier rebirth in fictional form. It provided the language, symbols, and values that sustained Americans in their victorious fight against fascism in the Second World War. During the post-war years,

[2] *Wagon Train* (1957–1965) was a popular television Western with a distinctive semi-anthological format. Its proto-ensemble cast found themselves in a new location each week, telling semi-allegorical stories about a broad range of contemporary issues.

[3] 'Hornblower' refers to a series of eleven novels, an unfinished novel and a few short stories by British author Cecil Scott Forester. They chronicle the rise of the eponymous hero, a fictional Royal Navy officer during the heyday of the Age of Sail at the end of the eighteenth and the beginning of the nineteenth century. Published between 1937 and 1962, the Hornblower saga enjoyed great popularity in the US during and after the Second World War.

Westerns reaffirmed once again the leadership position of the white, heterosexual, Protestant, Anglo-Saxon middle class in domestic realms. Internationally, they signaled that the US, like innumerable cowboy heroes on movie screens, would continue to ride into crises in order to save and protect the western world. However, Westerns also began to increasingly address unsolved problems and the broken promises of the US which undercut the general sense of optimism and upward mobility of the 1950s and early 1960s. The American Dream was anything but inclusive as it disadvantaged many pieces of the American cultural mosaic (e.g. African Americans, immigrants, women, the LGBTQ community, etc.). Movies like *Broken Arrow* (1950) and *High Noon* (1952) reflected the growing tensions of unresolved racial issues, and the excessive levels conformity that befell the US as it feared Communist subversion, respectively. Even President Eisenhower made no secret of his love for Westerns. It was, however, his successor who tapped into the metaphoric power of the frontier and used it to define the American *zeigeist* of an entire generation.

In his acceptance speech for the Democratic Party Nomination in 1960, John F. Kennedy located the American people "on the edge of a New Frontier--the frontier of the 1960's--a frontier of unknown opportunities and perils--a frontier of unfulfilled hopes and threats." He used the language of Westerns, which people were familiar with, and turned the frontier into a metaphor of change and progress by way of rhetorical displacement and projection. Kennedy's New Frontier is often simplistically equated with America's space race with the Soviets. In fact, it was much more comprehensive since "[b]eyond that frontier are the uncharted areas of science and space, unsolved problems of peace and war, unconquered pockets of ignorance and prejudice, unanswered questions of poverty and surplus" [7]. Kennedy then asked his fellow Americans to resuscitate the rugged can-do spirit of the hardy pioneers of old to face the new challenges of the 1960s with the same vigor he himself purportedly embodied. The New Frontier was encased in a broad belief in the good of science and the liberal ends it could serve at the hands of the administration. If the federal government could successfully send a man to the moon, then surely it could solve earth-bound problems such as racial inequality and poverty. The 1960s were still permeated by anxieties over a possible nuclear fallout, juvenile delinquency, and a population that had increasingly become 'unruly'. Even so, there was a belief that if science could solve technological problems, solutions to social and cultural challenges could not be far behind.

Modeled after the TV-Western *Wagon Train*, space as the 'final frontier' in *Star Trek* was then but a science-fictional echo of contemporary frontier discourse that was used for allegorical purposes. *Star Trek*'s utopian future bears the imprint of Kennedy's liberal progressivism. Extrapolated from the New Frontier of the 1960s, in *Star Trek*'s future we see how scientific and technological progress had solved the most pressing issues like hunger, disease, inequality, and environmental destruction. Instead of being driven by personal gain and wealth, these achievements allowed humans to pursue lives of self-improvement and exploration. And, in the vein of Manifest Destiny, the United States, like the United Federation of Planets in *Star Trek*, would lead the way for everyone else to follow. Frontiers continued to appear

after the first run of *TOS*. New incarnations of *Star Trek* subsequently reflected those new frontiers ranging from continued racial conflicts and gender issues in the 1980s and 1990s, to the frontiers of terrorism and their ideological fallout in the 2000s. Still, it bears to keep in mind that *Star Trek* was never conceived as a space western. The way it imagined its future world of space exploration actually mirrored a period in British history which further explains the geopolitical self-image the United States internalized in the post-war years.

Worldbuilding – Pax Transatlantica, or the Best of Both Worlds

In further defining *Star Trek* as 'Hornblower in Space', Roddenberry gave us the means for understanding its fictional world as a science-fictionalized version of the British 'Golden Age of Sail' of the eighteenth and early nineteenth century. Starfleet ships behave and function a lot like Royal Navy vessels in the past. They perform a wide array of tasks, ranging from exploration, trade and diplomacy to colonization and defense. Starfleet captains are essentially 'fighting naturalists' in outer space recalling the exploits of naval heroes such as James Cook and Horatio Nelson; they are not space cowboys. A distinct naval tone – noticeable in language, symbols, and rituals – permeates *Star Trek*'s future age of discovery and exploration [8]. What is more, the reasons for why a distinctively British character like Hornblower, and his naval/imperial world, were compatible not only with Roddenberry's worldview, but also with the American *zeitgeist* point to significant geopolitical shifts and transatlantic continuities in the Anglosphere.

Star Trek's British naval world both reflects and expresses the United States taking up the baton from the British as the new hegemonic leader and protector of the western world. The US emerged as the new Anglophone superpower from the Second World War. Americans subsequently integrated into their providential role as a leader of nations, the self-proclaimed role of 'benevolent' empire that had been assumed by the British during the nineteenth century. *Star Trek* is a popular culture barometer for charting the transition from the doctrine of *Pax Britannica*, which was disrupted and ultimately destroyed by two successive world wars, to *Pax Americana*, which replaced it in the polarized world of the Cold War. Prior to the two world wars, the US and the Britain had already gone through a Great Rapprochement (1895–1915) which solidified their political, economic, military, diplomatic, and cultural ties into the transatlantic backbone of the western hemisphere. Both Kennedy (b. 1917) and Roddenberry (b. 1921) belonged to a generation of young Americans whose formative years were informed by a distinct Anglophilia and sense of transatlantic cultural connectedness. They grew up "in a cultural milieu in which an American was encouraged to imagine himself part of an English-speaking tradition of democratic and individualist values that extended far beyond American history in both geography and time" [9, p. 24]. C. S. Forester's *Hornblower* novels were also a product of those times. While the Western may have reigned supreme, Hollywood was also engaged in a prolific love affair with British history, subjects, and actors roughly between the 1930s and 1950s. Sea adventure and empire films,

like *Mutiny on the Bounty* (1935), *Clive of India* (1935) and *The Charge of the Light Brigade* (1936), portrayed British explorer/adventurer types as *beau ideal* [10]. Most of these films depicted a blatantly uncritical idealization of the white man's burden. They celebrated a benign and paternalistic colonialism that was worth imitating and continuing by Americans. The values and the ideology offered by these stories were, of course, compatible with the self-image of the United States, as a continental nation, which was already on its way to extending their Manifest Destiny on a global scale.

While the immediate aftermath of the Second World War saw massive decolonization efforts, the United States quickly stepped up to replace formal imperial structures of its predecessor with its own greatly expanded 'informal', i.e. chiefly economic mechanisms of neo-imperialism. America's growing reach and influence became clear already during the Truman and Eisenhower years. Even so, it was President Kennedy who announced to the nation and the rest of the world that the US would take up the baton of leadership in the western hemisphere. He did so by merging his New Frontier ideology and rhetoric with references to Anglophone commonalities and continuities. In his inaugural speech he asserted that "[in] the long history of the world, only a few generations have been granted the role of defending freedom … I do not shrink from this responsibility--I welcome it." He identified "those old allies whose cultural and spiritual origins we share" [11], as America's immediate predecessor, underscoring the hegemonic continuity of the Anglo-Saxon-Protestant mythos. At first glance, this might seem to be at odds with Kennedy's liberal progressivism. His candidacy and administration were cloaked in only the *image* of liberal progressivism. The Kennedys' style was elitist, command-driven, and reminiscent of the concept of *noblesse oblige*. It was the Kennedy administration who remodeled the White House both literally and figuratively into a modern-day court, popularly remembered as Camelot.

Kennedy's persona as a romantic/hero president was rooted in his life-long affinity for British history, adventures, and romance. Since his childhood, the future president had been inspired by the tales of Ivanhoe, Robin Hood, King Arthur as well as the works of Sir Walter Scott, Rudyard Kipling, and especially Winston Churchill. Consequently, it is no surprise that a pronounced Anglophilia runs through Kennedy's best-known speeches. He repeatedly referred to English and British political figures in his acceptance speech for the Democratic Party nomination – his New Frontier speech. He invoked Richard I, Henry II, Richard Cromwell, Winston Churchill, and David Lloyd George to signal and demarcate major segments and transitions in the speech. Like he later announced in his inaugural, the president's "identification with heroes of British history would be translated into his vision of America as the legitimate successor to the Empire as defender of freedom in the world" [9, p. 35]. The British relied on their imperial agents, romanticized as heroic, benevolent, aristocratic figures, to maintain and defend *Pax Britannica* in the nineteenth century. Kennedy's emissaries, such as the Astronaut Corps, the Green Berets, in whose formation he was a chief architect, and the Peace Corps, were conceived and portrayed in a similar vein as they promoted *Pax Americana* in the twentieth century.

Consequently, it is but a small step to see how and perhaps why less than a year after Kennedy's assassination, Roddenberry took a fictional British hero and his naval world, which were conceived in the same romantic tradition as the president's heroes, and used them as a model for a science-fictional world that would carry on Kennedy's legacy of New Frontier space exploration. While seemingly incongruous, Roddenberry's decision to model *Star Trek* on a historical era, which saw the genesis of Britain's geopolitical dominance and assumed ideological superiority, simply mirrored Kennedy's ideology of continuing Anglocentric hegemony under American auspices. In Captain Kirk and his successors, we see a thinly veiled American incarnation of Hornblower who served as the president's fictional proxy. Moreover, the new spirit of exploration and the broad belief in the potential of science, which emerged during the space age, were also compatible the memories of the west's 'original' Age of Discovery that had manifested during the Enlightenment. While the geopolitical preeminence of the United States remains uncertain in the twenty-first century, the Federation and Starfleet took the helm as an Anglocentric hegemon in *Star Trek*'s world of the future, thus continuing that which its historical, ideological, and cultural predecessors had done for roughly two hundred years.

Conclusion – Continuing Voyages

Star Trek: The Original Series was a product of powerful cultural shifts, myths, images, and beliefs that permeated American culture during the 1950s and 1960s. As an sf artifact, it not only bears the imprint of the times but, thanks to its allegorical premise, it also remains a popular culture mirror for looking at America's self-image from a critical vantage point. Even though its original run ended in 1969, the *Star Trek* formula was such that it could easily be adapted to changing contexts by virtue of the frontier's inherent metaphoric characteristics while supported by a stable utopian world of scientific progress and discovery. *Star Trek* has been prolific for fifty years; so much so that the continuing allegorical and didactic premise of the *Star Trek* universe offers a popular culture lens through which we can view American culture throughout the second half of the twentieth century and the early 2000s.

For example, this is how we can use *Star Trek IV: The Voyage Home* (*ST:IV*) and its lighthearted 'time-travel-save-the-whales'-story to better understand the efforts of environmentalists during the 1980s to curb human-induced extinction of species and raise awareness of environmental pollution and exploitation [12]. By the same token, *Star Trek VI: The Undiscovered Country* (*ST:VI*) reflects the United States' initial attempts to come to terms with the dissolution of the Soviet Union and its disquieting implications for the only remaining global superpower [13] – implications that Americans have yet to fully reconcile with. An episode like *Star Trek: The Next Generation*'s (*TNG*) "The High Ground" [14] offered an American take on contemporary terrorism like the Irish Troubles; its comments on the 'unreason' of terrorism remain eerily pertinent in our post-9/11 world. *Star Trek: Deep Space Nine* (*DS9*) on the whole is a popular culture mediation on the interventions in the Balkans by the Clinton administration. In order to compensate for the less than

satisfactory outcome of the US involvement in the Balkans, the show, like the administration, tapped into the comforting memories of America's victory over Nazi Germany. A two-part episode like *Star Trek: Voyager*'s (*VOY*) "Workforce" [15] speaks to the growing emasculation of union power and labor representation in our neoliberal, transnational corporate reality. Season three of *Star Trek: Enterprise* (*ENT*) is then a largely failed attempt to cope with the trauma incurred by 9/11 in science-fictional form. After a decade-long absence of *Star Trek* on television, the launch of *Star Trek: Discovery* (*DSC*) in September 2017 promises to continue on a trajectory that will offer us more stories through which to view American culture of the second decade of the twenty-first century.

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How to Name a Starship: Starfleet between Anglo-American Bias and the Ideals of Humanism

Martin Gabriel

Abstract

The names of Starfleet vessels can tell us a lot about the cultural traditions that were foremost in the minds of the creators of the franchise. Their bias is representative of *Star Trek*'s problem of living up to its own standards of promoting humanist ideas, common values, and equality, standards that are supposed to lie at the heart of the United Federation of Planets (UFP). The author has analysed the ship names used in *Star Trek* films and series and found that nearly 60% of ship names come from Anglo-American traditions. While it is stated that English is the lingua franca of the UFP, this alone does not excuse such a strong cultural bias. Rather, ships names in *Star Trek* show us (1) that only certain names or terms were deemed worthy of being adopted, and (2) which larger cultural traditions were being promoted, while others were left aside. The dominance of Anglo-American cultures in mid-twentieth century television and movies was perpetuated, and *Star Trek* ignored much of Earth's (real) and the Federation's (fictional) cultural richness.

Keywords

Cultural history · Ethnocentrism · History of ideas · Humanism · Imperialism · Media history · *Star Trek* · Starfleet

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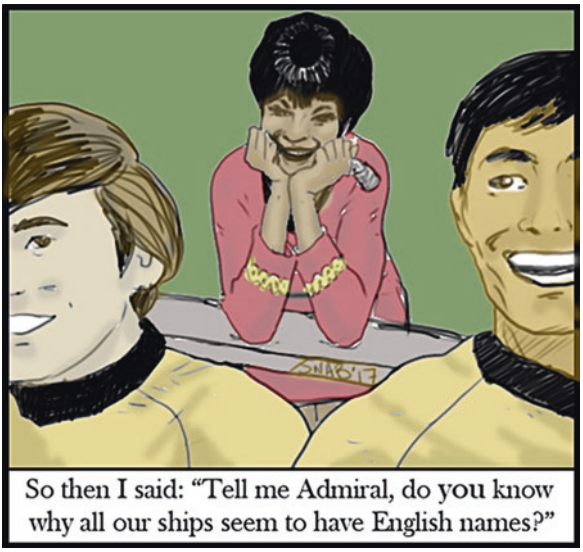

Editors' Log: Chapter 04

Accepting and embracing cultural, ethnic or religious differences was promoted as one of the pillars of the United Federation of Planets across the entire *Star Trek* franchise. However, as Martin Gabriel shows in his essay, when it comes to the naming of Starfleet ships, the dominance of Anglophone and/or Anglo-American traditions seems to contradict the franchise's inclusive and humanist vision. The naming is more often bound to naval and military traditions (e.g. aircraft carriers of World War II) than to the inclusion of explorers, non-Western scholars, or women. (**Eds.**)

***Star Trek: Enterprise*, 04×13, "United" (2005)**
***Shran**: Have you served on all these vessels?*
***Archer**: A few of them are a bit before my time, but they were all named* Enterprise. *This one sailed Earth's oceans almost four hundred years ago.*
***Shran**: My vessel, the* Kumari*, was named for the first ice-cutter to circumnavigate Andoria. Perhaps future ships will be named after our vessels, especially if we do something historic together.*

Star Trek: Deep Space 9, 07×24 "The Dogs of War" (1999)
Admiral Ross: *All hands, attention to orders. From Starfleet Headquarters, Office of the Admiralty, to Captain Benjamin L. Sisko. As of this date, you are requested and required to take command of USS* Sao Paulo. *Signed, Vice Admiral William J. Ross, Stardate 52861.3. Computer, transfer all command codes to Captain Sisko.*

(continued)

***Computer**: Command codes transferred.*
***Sisko**: I relieve you, sir.*
***Ross**: I stand relieved. She's all yours, Ben. You've got a fine ship here. (…) Oh, by the way, there's something else on that PADD that might interest you.*
***Sisko**: Special dispensation from the Chief of Starfleet Operations to change the name from Sao Paulo to* Defiant.

The fact that TV shows and movies are perfectly suited to either change or strengthen certain cultural, historical or social perceptions, is not new. Media history has become an important part of historiography and can offer precious insights into how the depiction of real or fictionalized historical events is both a source representing the time in which the media source has been produced but also providing us with specific details of how, for example, elements of "history" or "culture" were perceived at the time of production by the producers and, very likely, by the audience (for an introduction see: [1]). *Star Trek: The Original Series* (*TOS*) its spin-offs and the movies did not function in a cultural vacuum. On many occasions, researchers have pointed to the Cold War background of the first show (e.g. [2]), its political and racial implications (and some progressive approaches the producers realized, like, among others, including a Russian as helmsman). Many researchers have identified the USSR as paradigmatic blueprint for the Klingon Empire. Only in the last few years have historians pointed to the parallels between, for example, the European Middle Ages and Klingon society [3].

In contrast to this prolific research, little attention has been paid to one specific question: how did *Star Trek*, over the decades, deal with promoting its ideas of humanism and equality when it came to the naming of Starfleet vessels? The starships were always an integral part of the different shows and movies, and – within the *Star Trek* universe – serve as one of the most important embodiments of the Federation's presence and values. One might suspect that naming conventions would concur with the show's generally humanist approach, resulting in a wide spectrum of ship names drawn from many different cultural backgrounds. In fact, however, an analysis of 162 starship names shows that – through all of the five TV shows and ten movies – there is an absolute dominance of names we are able to trace back to Anglo-American cultural and historical traditions.[1] Names or terms with Anglophone backgrounds account for about 57% of all ship names, and if we look at Anglophone and other European backgrounds combined, the number rises to 77%.

[1] In this analysis, I have included 162 starships that have either been shown or mentioned on screen, or those that have been defined by production staff as "canonical" in some other way; not included are ship names shown on so-called "Okudagrams", since a majority of them are, in fact, inside jokes, "Easter eggs" and/or apocrypha.

What can these naming traditions tell historians and other researchers? Of course, the Anglo-American identity of most of the people responsible for *Star Trek*, and the fact that the franchise was produced primarily for an Anglophone audience, can explain why the makers often chose ship names coming from an Anglo-American tradition. However, this contradicts the general approach to equality propounded by *Star Trek*. After all, Starfleet and the Federation are supposedly multicultural and multi-ethnic entities. Only in 1993, in the episode "Descent", did the producers of *Star Trek: The Next Generation* (*TNG*) include the first Federation starships bearing the name of a fictional non-human character, *Gorkon*, and, in the same episode, of a Native American, *Crazy Horse* [4].[2] Since other cultures, especially from the Arab world and Africa, are also marginalized throughout the history of the franchise, we get a picture that indicates a persistent ethnocentric worldview being vindicated by the people responsible for *Star Trek*. Ethnocentrism is, according to sociologist William G. Sumner who coined this term in 1906, "the technical name for this view of things in which one's own group is the center of everything, and all others are scaled and rated with reference to it" [5, p. 13]. We cannot denounce ethnocentrism as being negative *per se* – on the contrary, research in social cognition and evolution theory suggests a sometimes positive and stabilizing influence [6]. Nonetheless, the idea behind *Star Trek* in general and especially the portrayal of the Federation, would have legitimized an approach more open to the traditions of cultures outside of the Anglo-American or European spectrum. While *Star Trek* has been quite progressive in other areas, the naming of ships does not support the notion of the franchise's "rejection of ethnocentrism" and "resistance to the status quo" [7, p. 34]. What has been realized, when it comes to the naming of Starfleet ships, is the continuation of dominant "Western" cultures, in particular an Anglo-American and Anglophone cultural tradition. Without doubt, there would have been more than enough room in the different shows and movies to break with this dominant paradigm – like many of the (non-canon) *Star Trek* novelists have done by introducing more ships with "exotic" names in their stories. On screen, however, the classic worldview, based on the political supremacy of the US and the notion of "Western" cultural importance, seems to have had the upper hand from *TOS* to *Star Trek: Enterprise* (*ENT*), from *Star Trek: The Motion Picture* (*ST:I*) to *Star Trek: Nemesis* (*ST: X*). Consequently, *Star Trek* carried on the legacy of a world characterized by inequality – a phenomenon that, as Frederick Cooper mentioned, is nothing new. It was formed (and reformed) over and over again by the powerful and their subjects in very specific social environments as well as in the broadest horizons of imagination [8, p. 387].

If we assume that there is an (intentional or unintentional) ethnocentric attitude behind the *Star Trek* franchise and the way how the many starships were named, how can historians deal with this topic in a larger scientific context? We stand to benefit from including *Star Trek*'s failure to live up to its own standards in regards

[2] The only other canonical starships bearing names of Native American origin are the *USS Ahwahnee* (*TNG*), *USS Lakota*, and *USS Tecumseh* (both *Star Trek: Deep Space 9*). As of mid-2017, the *USS Gorkon* remains the sole example of a Federation starship not to be named according to Human or (fictional) Vulcan traditions.

to humanist ideals (in the case of the starship names) into historical studies of the traditional imperialist Anglo-American master narratives and success stories and *vice versa*. In many discussions the idea of *Star Trek* as "Space Western" is still perpetuated vividly. If we take a look at some terms used throughout the franchise (especially in *TOS*) – most obviously the term "frontier" –, then there are certain aspects that can definitely be traced back to the stories and histories of the Anglo-American expansion in North America between 1600 and 1900. Captain James T. Kirk (William Shatner) is still regarded a "space cowboy" [9, p. 57] by researchers and journalists. Nonetheless, recent studies have shown that a large part of *Star Trek*'s (and Starfleet's) identity is based on another feature of Anglo-American narratives: the naval traditions of the US and, maybe even more so, Great Britain. Combined with the influence of US Westerns as well as the space program of the 1960s, this results in *Star Trek* featuring a specific "transatlantic double consciousness" [10, p. 5]. The history of seafaring and the sea itself "has often surfaced as a potent symbol of the franchise's very essence: the desire to see what lies beyond, the challenge of traversing the seemingly infinite" [9, p. 66]. We could explain some of the underlying identification of *Star Trek* with the history of maritime exploration in what is generally called "Early Modern Times" (c. 1500–1800), an era usually deemed much less political than scientific, much less authoritarian than enlightened. However, from a historical point of view, the explorations of Cook, or – even earlier – of Magellan (namesake of starships in *TNG* and *DS9*), cannot be understood without placing them into the bigger picture of the European quest for riches, new colonies, and, ultimately, global hegemony. European exploration of the greater Atlantic region, which resulted in the conquest of the Western hemisphere and the opening of the "veins of Latin America" (Eduardo Galeano) [11] enabled not only Spain, but also France, Britain, the Netherlands, and others to seize and strengthen control over other parts of the globe.

Early modern exploration ventures certainly improved knowledge of the world. Nonetheless, explorers are hardly recognized by the producers of *Star Trek* when it comes to serving as namesakes – we do not hear about a *USS Cook* or *USS Columbus*,[3] and even less about starships named, for example, after the Portuguese Dias or the French Bougainville.[4] The story of European (and American) expansion, as it is told by the names of Starfleet ships, sets in later in the 18th and nineteenth century. In

[3] There is, in fact, a twenty-second century Earth starship named *Columbia* (*ENT*: "Fortunate Son" etc.). From the eighteenth century onwards, *Columbia* ("Land of Columbus") served as female personification of America. In *ENT*, the name *Columbia* paid tribute to one of NASA's Space Shuttles. Consequently, the use of the name *Columbia* in *Star Trek* reflects more strongly on US than on European cultural traditions.

[4] Bartolomeu Dias is the first European known to have reached the Indian Ocean via the Atlantic (1488), Louis Antoine de Bougainville was the first French explorer to circumnavigate the world (1766–1769). There has been one US Navy ship named *USS Bougainville* (in service from 1944 to 1946), and in 2016, the Department of the Navy announced that the amphibious assault ship LHA-8, expected to be delivered in 2024, will also be named *Bougainville*; however, both ships were named in remembrance of World War II's Bougainville Island campaign in the South Pacific, not for the explorer himself (who is the island's namesake).

fact, the first captain in Roddenberry's show, Robert T. April, had a clearly defined archetype: "A shorthand sketch of Robert April might be 'A space-age Captain Horatio Hornblower', lean and capable both mentally and physically" [12]. This gives a hint towards the naval traditions adopted in the franchise: on the one hand, it is the historical and mythical narrative of the British Royal Navy in the time of the Napoleonic Wars, and, on the other hand, the twentieth century US Navy – especially aircraft carriers – serve as models for Starfleet. It becomes quite obvious that the ideals of humanism, i.e. inclusion of different cultures, esteem of science and peace, etc., did not count much when the fictional Starfleet ships were named. We do not know exactly when humans began to name their ships (either officially or unofficially), but the naming of naval ships can be a highly controversial issue [13]. In the *Star Trek* universe, Anglo-American traditions dominate the naming of starships in two ways: first, in the reception of a larger number of military/naval terms and names, and, second, by ways of introducing many names of historical characters with Anglo-American backgrounds. Thus, the franchise continues to reflect only very selectively on the history of mankind. The great contributions, for example, of Muslim and/or Arab scholars to the scientific and cultural development of different societies are almost completely ignored; the starship *USS Al-Batani*, named for a Syrian astronomer and mentioned in the *Star Trek: Voyager* (*VOY*) pilot episode "Caretaker" [14],[5] is the only notable exception. Instead of following a really humanist approach, the predominance of Anglo-American culture(s) is reinforced also by the ship naming conventions (in addition to English being the Federation standard language, a majority of main characters being Anglo-Americans etc.).

No scholar of history would ever deny the role played by the classic Greek and Roman cultures in the development of democracy – a feature central to the *Star Trek* universe. There are at least 11 starships mentioned in the canon whose names can be traced back to Greek and Roman antiquity. However, none of these names has anything to do with statesmanship, democracy, politics or science. Instead, we find names of deities and other mythological figures, like *Hera* [15] or *Pegasus* [16]. There is also no mention of European historical characters who could be seen as icons of the continent's long democratization efforts. Rather, the franchise uses names connected to the master narrative of *American* democracy since the eighteenth century. A name like Thomas Paine very likely resonates little with a non-American audience, but, of course, it pays tribute to one of the United States' "Founding Fathers" (see for example [17]) – a tribute easily understood by an Anglo-American audience while also reinforcing the narrative of America's importance for the development of democracy with a non-Anglophone audience interested in the background of the ship's name. A US president like Harry S. Truman, from an American point of view, can be seen as defender of freedom and democracy (at the end of World War II and during the early days of the Cold War), and – in this function – serve as logical namesake for a US Navy ship or a fictional starship as the

[5] Al-Batani (also Al-Battānī or Albategnius) lived and worked in the northern Syrian city of al-Raqqah in the late ninth and early tenth century. His works are considered instrumental for the development of astronomy, and were frequently cited by Copernicus, Brahe, and others.

one mentioned in the *DS9* episode "Field of Fire" [18]. However, it does seems less appropriate when we think of him ordering the only actual use of atomic bombs in war set against *Star Trek*'s propagated humanism. In this case, once again, the national history of the United States and its dominant political (and military) position in the twentieth century, trump the often cited ideals of *Star Trek*.

The way *Star Trek* dealt with the issue of starship names shows us that the ethnocentric traditions of the twentieth century, maybe even an imperialist approach to cultural history, were vivid throughout the production of the franchise. Only some cultural backgrounds were accepted into the canon when it came to finding namesakes for the fictional ships, and the percentage of names and terms from Anglo-American backgrounds remained disproportionately high over the decades. For historians, this fact can result in two conclusions from the fields of media as well as cultural history – first, the franchise failed to live up to its own standards: while preaching a supra-national (and even supra-planetary) world view, which is centred on the basic features of equality, peace, science, and democracy, the ship names used in *Star Trek* paint the picture of a media phenomenon strongly influenced by the inequalities of the past and the present. Imperialist and national (hi)stories are continually adopted either through the use of controversial namesakes for starships or through the absence of certain (regional) cultural traditions. World regions marginalized throughout history meet the same fate in *Star Trek*'s ship naming policies, and a chance to interest a broader audience in these cultures is ignored. Second, from a cultural historical point of view, we can analyse which names, terms, events or geographical places were deemed suitable for starship names. The franchise fails to break with (debatable) conventions. Naming a Federation ship after the conqueror of the Aztec (Mexica) state, Hernán Cortéz [19], seems highly controversial.[6] Obviously, the recognition value and the tradition of naming vessels after successful military commanders, once again, was more important than accepting the ideals of a fictional universe.

In the end, ship names in *Star Trek* indicate the continued dominance of classic "Western" views on historical processes, the triumph of the Anglophone world[7] over all other regions, of military traditions over the importance of science, of male politicians or generals over female scholars.

[6] Even more so, if we take into account what Gene Roddenberry had to say about possible future encounters with extra-terrestrial life: "Only hope we'll be wiser when we meet the 'Aztecs' or 'Mayans' of another planet. In the infinite possibilities 'out there', if we act like savages, we may find someone quite capable of treating us as savages." [20, p. 177]. Influenced by the US educational system of the mid-twentieth century, Roddenberry might have hinted at the so-called *Leyendra negra* ("Black Legend") of Spanish colonial rule, which had served for decades as justification for nineteenth and early twentieth century US expansionism in the Americas and the Pacific. One of the most recent publications on Cortez and Euro-American cultural contact in sixteenth century Mexico is [21].

[7] The namesake for *Star Trek*'s 2017 spin-off, the starship *Discovery*, is continuing this tradition, even though the show also prominently features the obviously Chinese-named *USS Shenzhou*.

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The Computer of the Twenty-Third Century: Real-World HCI Based on *Star Trek*

Gerhard Leitner and John N. A. Brown

Abstract

There is a long way to go before our current levels of Human-Computer Interaction (HCI) reach the levels seen on *Star Trek*. At the same time, it is surprising just how many of those fictional futuristic features are currently technically possible. All that is missing is the ease of use and reliability that were conveyed in *Star Trek*. To get there, we have to teach our technicians and engineers to focus more on the dependability and usability of technology, and less on profit-based iterative cycles that push devices to be faster, smaller, and disposable. In 1991, Mark Weiser was driving the development of new devices at Xerox PARC when he wrote an article describing the state-of-the-art of HCI at the time and discussing the psychological and technological changes that would be required for an advance towards the HCI he imagined would exist in the near future. This inspirational treatise was called "The computer of the 21st century". Twenty-five years later, we look to the fictional HCI of the *Star Trek* franchise and lead our students to imagine the changes that could make our current state-of-the-art more like "The Computer of the 23rd century".

Keywords

Anthropology-based computing · Calm technology · Human-computer interaction · Peripheral interaction · Smart Homes · SNARK circuit · Star Trek · Usability · User Experience Design · Voice-based interaction · Wise home

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Editors' Log: Chapter 05

A remarkable feature of *Star Trek* is the ease with which devices and interfaces are used by humans and aliens to interact with complex, pervasive, and often almost-invisible technical systems. In this chapter, psychologist and computer scientist Gerhard Leitner and Human Factors specialist John NA Brown explore the concepts of Human Computer Interaction (HCI) and User Experience Design (UX Design) that are found in *Star Trek*, and show us how they differ from the state-of-the-art interfaces that currently connect man and machine. (**Eds.**)

***Star Trek: The Original Series*, 01×21, "Tomorrow Is Yesterday" (1967)**
Kirk: *Captain's log, supplemental. Engineering Officer Scott informs warp engines damaged, but can be made operational and re-energized.*
Computer: *Computed and recorded, dear.*
Kirk: *Computer, you will not address me in that manner. Compute.*
Computer: *Computed, dear.*
Kirk: *Mister Spock, I ordered this computer and its interlinking systems repaired.*
Spock: *I have investigated it, Captain. To correct the fault will require an overhaul of the entire computer system and a minimum of three weeks at a starbase.*
Kirk: *I wouldn't mind so much if it didn't get so affectionate.*
Spock: *It also has an unfortunate tendency to giggle.*

(continued)

***Star Trek: The Animated Series*, 02×03, "The Practical Joker" (1974)**
Spock: *Question. Why are we unable to communicate with crewmembers McCoy, Sulu and Uhura?*
Computer: *Answer. That is for me to know and for you to find out.*
Kirk: *Did I hear that right?*
Spock: *Affirmative. The dysfunction is more severe than I thought. Question. Are you deliberately holding our missing crewmembers prisoner?*
Computer: *I'll never tell.*
Kirk: *Let me try. This is Captain James T Kirk speaking. You are programmed to obey any direct order I may give, correct?*
Computer: *Correct.*
Kirk: *Very well. I order you to release crewmembers McCoy, Sulu and Uhura immediately.*
Computer: *Say please.*
Kirk: *Well, I'll be.*
Spock: *I suggest compliance, Captain.*
Kirk: *Pu-leese.*
Computer: *Say pretty please with sugar on.*

***Star Trek: The Next Generation*, 02x16, "Q Who" (1989)**
Sonya: *Hot chocolate, please.*
LaForge: *We don't ordinarily say please to food dispensers around here.*
Sonya: *Well, since it's listed as intelligent circuitry, why not? After all, working with so much artificial intelligence can be dehumanising, right? So why not combat that tendency with a little simple courtesy. Thank you.*

"It's interaction, Jim, but not interaction as we know it."

"There is more information available at our fingertips during a walk to the woods than in any computer system, yet people find a walk among trees relaxing and computers frustrating. Machines that fit the human environment instead of forcing humans to enter theirs will make using a computer as refreshing as taking a walk in the woods." [1]

Can you imagine how long a *Star Trek* episode would have lasted if they had to use the kind of standard speech recognition engine that we have on our current computers or smartphones?

If you're not sure what the big deal is, please try to issue a *Star Trek*-style voice command to Siri, Cortana, or Google' voice assistant and see what happens. Even if these systems are usually quite stable, would you want to trust them to work all of the time? Could you trust them enough to calmly say "energize", counting on the system to work the first time and teleport you to safety in the very last second before the planet you are currently on explodes?

Kirk could.

Accurate and reliable voice recognition is only one aspect which differs between the interaction in *Star Trek* and real life. Others will be discussed in detail within this article. We work in Smart Homes and draw our examples from the principle *Star Trek* locations – the *Enterprise* and other starships, and space stations such as *Deep Space Nine*. These are hybrid locations, not only representing the work place of the crews, but also their homes, with accommodations for guests from the four quadrants of the universe. It might seem that many interactive features of the franchise could be beneficial in a modern-day home, if that home were just "smart" enough.

"The helm is not responding, Captain. Permission to turn it off and on again?"

At the end of the 1930s, *Popular Mechanics Magazine* published an issue entitled "The Electric Home of the Future" [2] . Since then, every few years we hear of future innovations, with new labels. The current label is the Internet of Things (IoT) but, in principal, the basic concepts have not changed very much. The interior design of the imagined home from 1939 is reminiscent of the look and feel of the interiors from *Star Trek: The Original Series* (*TOS*). This might be due to the fact that *Star Trek* creator Gene Roddenberry was also developing his mental model of the future under the socio-cultural influences of roughly the same time-space coordinates. However, the functional range and ideas for the future home were and are still mundane when compared to those imagined by Roddenberry.

Much of this imagined technology is beyond the scope of this chapter. For example, let's briefly consider the teleporters. As we write this, teleportation is still in its earliest stages of theoretical development, at least for molecular structures bigger than a photon. Once developed to a point of *Star Trek*-like efficiency and accuracy, it will reduce rescue and recovery missions to a mundane flick of a switch and solve the traffic problems on our entire planet (so long as we make sure that there is no fly in the teleporter... but that is a different story). The main focus of this chapter are those devices and features involved in the interaction between humans and their built environment, the classic domain of Human-Computer Interaction (HCI).

"I can nae get the power, Captain. She's configuring her updates!"

One central concept of *Star Trek* environments which is quite different to current technology in the home is the idea of a single holistic computer that supports everyone in all tasks. The "Computer" is accessible from each device from every location (inside and outside the ship, in a shuttle and even on the surface of an alien planet) and provides everything that is appropriate, not only in terms of content and function, but also in terms of modality. For example: "Computer, please show me the

status of the surface of planet X" issued on the bridge would provide visual information on the display in front of the person who issued the command. Asking the computer for information from within the captain's private room would result in an audio message containing the required information.

When taking a look into current homes, be it fully smart, partly smart, or not smart at all (in terms of technology), the vast majority are characterized by a smorgasbord of electronic devices, hardware controls, software interfaces, and remote controls. Most of the time, the components or subsystems are not compatible with one another, do not cooperate, and cannot be used in combination. This is a big contrast to *Star Trek*'s computerized premises wherein the "Computer" presents itself to its human cohabitants as a holistic entity, which can be easily, accurately, and reliably accessed in a wide variety of natural ways.

The user does not have to worry about "the backend"; about what is going on behind the curtain. This is a beautiful way to imagine the interaction between human and machine, and it was reflected, 25 years after the launch of *Star Trek*, in the inspirational writings of Mark Weiser, who is quoted at the head of this chapter. For a few years in the late 20th century, Weiser was one of the people driving the development of new devices at Xerox's Palo Alto Research Centre (Xerox PARC). He had a notion for a different way to look at the design of HCI, inspired in part by the philosophical and psychological work of his occasional co-author John Seely Brown and many others [3]. This notion was that technology that can be used well does not require the conscious attention of the user. Rather than being the centre of attention, the well-designed tool sits at what Brown called "the periphery" [4]. The article Weiser published 25 years before this writing, the first of a half-dozen seminal works in the field, described the state-of-the-art of HCI at the time and discussed the psychological and technological changes that would be required for an advance towards the HCI he imagined would exist in the next generation. To summarize his core idea, the computer should allow humans to stay focussed on their tasks, rather than forcing them to focus on the computer's own processes. Towards this end, PARC was developing portable computers which were limited in power and functionality, ranging in size between 1 m "boards" and 2,5 cm "tabs". The power of these devices was that they were networked with a single core computer, and could be shared between users in a common environment. As he put it, "Even the most powerful notebook computer, with access to a world-wide information network, still focuses attention on a single box. By analogy with writing, carrying a super laptop is like owning just one very important book." [1]

"Siri, where are the nuclear vessels?" "I'm sorry, I do not understand: 'Fear art. See new, clear weasels.'"

This concept of a central entity in a common environment makes it easier to understand and interact with the system, not only for the characters in *Star Trek* (who are, sorry to destroy the illusion, fictional and portrayed by actors), but more

importantly – for the more important "users", the audience. This can be considered one important principle for the success of the series. It seems that – although the technologies presented to the viewers are unknown – they seem at least to be plausible and at best to be natural.

In contrast to some interface designers and IT engineers responsible for the design of current devices and interfaces, the screenwriters and scientific advisors of *Star Trek* seemed to have had human capabilities in mind and seem to have focussed on how to address those capabilities and their associated limitations, as well.

Although the variety of devices in our homes is now comparable to the variety of fictional ideas presented in *Star Trek*, we are far from achieving their smooth interoperation. Desktop computers in the home office, laptops on the dining table, tablet PCs and smartphones to move around, all have separate and different user experiences through different devices, interfaces and networks. This miasma of differences is also related to another philosophy brilliantly conveyed in *Star Trek*, another philosophy that humanity has not yet achieved. Compatibility, interoperability, and unified interaction, look, and feel all have an economic value that is important to competitive markets and the market economy, and we have not overcome the idea that these should be driving forces in the design of software and hardware. In that way, it seems as though we are actually closer to the Ferengi, who put profit-based economy before all other considerations, than we are to Starfleet and the belief that people are more important than profit. However, there have been some developments which could be considered first steps towards the 23rd century.

"Captain, I cannot raise the incoming craft. It is using an incompatible interface and an out of date codex."

Those of you who witnessed the beginning of *Star Trek* might also remember the beginning of the Internet. When the World Wide Web (WWW) first became available to a broader population, one had to deal with browser compatibility issues. Fortunately, the "best viewed with browser X" issue was only temporary. It has almost disappeared (at least as an explicit statement). Thanks to developments such as the multiplatform Opera browser, there is no longer a general need to use specific devices or brands in order to access the "web" via a specific type of wired or mobile network. Instead, users can rely on the infrastructure to ensure that content and functions are appropriately rendered and presented. Although there are still some issues in supported technology (Flash, Java-script), things seem to be moving in the right direction.

In fact, the aforementioned Opera browser relates to the computer of the 23rd century in another important way. It is an example of community-based, open-source development – content and function are not developed a priori for business purposes, but are intended to advance the community. However, although software issues may be solved in the future, this is currently not the case in regard to hardware (e.g. when observing the situation of charging and data transfer adaptors for smartphones).

"Dammit Jim, I'm a doctor not a search engine!"

Another example which is not as mature as the multiplatform WWW, but still demonstrates respective possibilities, is data storage and retrieval. We mentioned universal access to data from every device and in each location over the holistic entity of the computer. This would implicitly require sophisticated data management.

Despite that implicit demand, we do not remember a single situation where a *Star Trek* crew member spent any time worrying about where to store their content, or from where to retrieve it again. To be honest, we do not even remember anyone explicitly pressing a "save" button or issuing an equivalent voice command. Is it possible that some critical information was "lost in space" because the users forgot to explicitly save it? Of course not; Autosave – which is also becoming common in several applications and websites that we use – was assumed to be a natural aspect of HCI in *Star Trek*. The question is – why isn't this function also considered natural on our computers? What is speaking against it?

The same applies to retrieving content. Even the temperamental and outspoken Dr. McCoy never had cause to say: "Damn, where did I save that file?". Can you imagine the following scene? A planet fills the display on the bridge, and the captain calls for information only to have Mr. Spock answer: "I am sorry captain, but I cannot find the relevant file. Might you be able to give me a hint as to where it could have been stored?". No, every piece of information is available, every time, everywhere and in a format that is appropriate for every context.

However, there is also potential for enhancement of functionality in this regard; specifically in the context of the home. We have seen first attempts to move in the direction of *Star Trek* technology. Cloud-based storage enabling the management of public, shared, individual, or private data is available via our digital devices. Personal and shared clouds let users store their information and digital content on spaces that are accessible from different devices, contexts and locations. Beside the big players in IT, there are also enterprises whose market model is the provision of such spaces. This eases data management because one can have a cloud drive where all the content is accessible from each location and each device. Theoretically, this is like *Star Trek*'s "Computer", but in reality, software add-ons are available for many platforms, and some manufacturers automatically support cloud based services, but most of the time only if they are accessed by their own devices. Again, this is not optimal, but it is a step in the right direction.

"Sir, the ensigns are refusing to wear red shirts and threatening to dox anyone who sends them on an away mission."

Security and privacy issues are strongly related to the question of storing and retrieving content. We must assume that certain parts of the databanks of the *Star Trek* "Computer" were restricted and classified. Otherwise episodes in which heroes or

villains tried to steal secret information would have involved hackers rather than infiltrators wearing fake ears or antennae.

But how was the security issue resolved in *Star Trek*? In the illusion provided, this was another feature the "Computer" was responsible for. It seemed to be natural that data would be stored with links to whatever security and privacy information would be relevant to their future retrieval. Who owns the data and who has access to it was therefore never explicitly addressed. However, such meta data has to be handled with great care in the cloud-based services here in the twenty-first century. People are frequently warned about putting work-related content into data clouds or using shared document editing. In some companies it is even forbidden. Password-secured systems do not seem to have high enough security. In *Star Trek*, when it came to accessing confidential data, or to issuing commands which might have significant consequences – such as self-destruction of the ship – the "Computer" asked for access information to make sure that the person issuing the command is both entitled to do the intended thing, and aware of the consequences of their endeavour. This was done by combining several security features rather than relying on a single one. That is, it was not enough to have the right password. That code had to be recognized, but so did the voice and irises of the speaker, for example. This combination of input signals made sure that a dramatic command could not be issued by the wrong person or by accident.

This combination, seen in *Star Trek* as a reflection of the security protocols used in the military and in early satellite communication, inspired us as designers of the user experience. It was clear that communication ought to feel natural to the user, but did ease of use have to limit security and robustness? If not, then current concepts of both natural HCI and robust security would have to be changed.

"Scanning the planet's surface for Snarks, Captain, but detecting only Boojums."

We have seen many developments in this regard. Finger print scans are integrated into keyboards, smartphones, door lock systems, and more, and iris scans are on the verge of entering the mass market. While these individual advances in commonplace security technology are impressive, what is missing is an equal advance in the common understanding of how security can be improved. Combining devices increases security while decreasing ease of use; but what if the combination could be designed based on natural human signals? This question, discussed in more detail elsewhere [5], led to the development of a system that could "Synchronize Natural Actions and React Knowledgeably" (S.N.A.R.K.) and a simple iterative circuit was designed to this end. This way, individual signals (whether detected mistakenly from noise, or accurately, but out of context) could be ignored and false positives could be avoided. In the early days of communication between the earth's surface and satellites in orbit, the signal was unreliable, with a lot of noise. The solution was to use triple modular redundancy, that is, the solution was to send each message via three different channels. Receipt of a single signal could always be

ignored, and receipt of three signals of equal meaning could always be trusted. Two signals of equal meaning triggered a query. In this way, the designers ensured that the interaction was always deliberate.

Not having a system like this would have meant that nobody in *Star Trek* would have been able to say the word "computer" in a normal conversation without accidentally having the second half of their sentence taken as a command.

An Upgrade from the Technicians of Cygnet-14

It might be worthwhile to take a look at one of the commercial products currently trying to bring voice interaction into the twenty-first century. The Amazon Echo© proposes the *Star Trek*-like idea of having a single holistic background entity in the home. Unfortunately, the Echo does not use the same name at home that it uses in public. It does not even use a neutral name like "Computer".

Instead, by default, it has to be called "Alexa". Clearly this was intended to give the system a kind of personal touch. Echo, or Alexa to her flatmates, seems to be a technological step towards the twenty-third century, at least in terms of digital features. The user can access information from the internet, and can stream music and audio books. Alexa also has access to a calendar, and to a weather forecast, and she can tell jokes and help the user edit shopping lists. Unfortunately, Amazon has not provided a commercial food replicator, though Alexa can start the oven remotely, so that the user can be welcomed by a ready-to-eat roasted pork when returning from a battle at the shopping mall's delta quadrant. In fact, Alexa is able to control a number of devices in the home via interoperability features with smart home systems, which is wonderful.

However, Amazon seems not to have noticed the issue of accidently triggering commands. As seen in Fig. 1, this problem is clearly illustrated in a tweet from a would-be user who wrote: "My girlfriend's name is Alexa, so this would accidentally trigger like 30 times a day."

Fortunately, and as we have discussed, the solution is out there. Amazon just needs to go on a S.N.A.R.K. hunt.

Fig. 1 A tweet in response to the obvious problem of false positives in Amazon's attempt to introduce a voice-operated digital assistant for help around the home (Retrieved from http://www.ibtimes.com/pulse/27-names-call-your-amazon-echo-instead-alexa-1720482)

Boldly Going Where No One Has Gone Before, in Order to Make It Accessible to Everyone

To summarize, despite the many examples of advanced HCI that already exist in the home, we are still very far from the twenty-third century, and there is a long way to go before we reach a level of HCI comparable to that seen in *Star Trek*. That said, one of the next steps has already been taken. It is now possible to have reliable and secure voice-based interaction that seems natural and intuitive to the user, provided designers and developers are willing to take the time needed to build it.

What about the step after that? We conclude this chapter with an excerpt from a book by one of the authors. This passage illustrates an imagined next step between the S.N.A.R.K. circuit and the computer of the twenty-third century, a next step inspired to no small degree by the examples of HCI in *Star Trek*:

"Sometimes it is the case that I go to bed after writing an article with the plan to do the final reviewing there. When my wife is awake it is no problem to take the e-book reader and read the produced outcome (with additional lights or without). Searching for the document takes some steps, because I have to go through the hierarchical structure of the storage, find the correct folder and file. In the case my wife has already fallen asleep, the procedure is different, because the manipulation on the e-book reader, the needed light and my movements would wake her up. The most unobtrusive way of reading a document would be to listen to it. On the technical level, this would not be a problem, if I had not forgotten to manually transcode the file into an audio, e.g. in mp3 format. However, the handling of the program streaming the audio file is based on visual and tactile interaction. I have to search the same hierarchy mentioned before to select the file, and this would also wake up my wife. Currently all the preparation would have to be done beforehand. A really natural way would be to handle content and information in a way as it has been demonstrated in Star Trek. Depending on the context, the available device and infrastructure one could spontaneously decide to interact with the holistic system in the backend and content is provided in the appropriate modality. This could even be established on the basis of components that are already present in a state of the art home, for example motion sensors. If, when going to bed, I were to recognize that my wife is asleep, I would not switch on the lights. I would put on a headset and, in my softest voice, whisper" James, recent". The system would immediately respond by an audio stream of my recently edited document, because it is aware of my context and that I am not using a visual device. With the command" recent" it would scan my recent activities (similar to functions that are already offered in diverse software programs, but across different devices) and find the recently-saved document, where ever it would be, either on my office computer (or on a networked attached storage). Recognizing that the document is in PDF, the system would simply transcode it and play it to me - all without disturbing anyone else." [6]

With the greatest of respect, we return now to Mark Weiser's seminal paper on interaction [1] and end by reformulating the famous citation we quote in our opening lines: "Machines that fit the human environment, instead of forcing humans to enter theirs, will make using the computer as delightful as it is on *Star Trek*".

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The Energy System in *Star Trek* and Its Real-Life Counterparts

Wilfried Elmenreich

Abstract

Generation and provision of energy is an important cornerstone of our civilization. *Star Trek* also addresses the energy topic multiple times and sketches a modern and powerful energy system, which provides seemingly abundant energy but also comes with significant risk of harming its users. In this chapter, we will address the properties of energy generation and storage in *Star Trek* and compare it to existing systems, which are in use or planned. The most prominent example are the fictional warp cores which power a starship's warp drive but also generally serve as power plant on the ship. Several episodes indicate that operating a warp core is a delicate control effort with risk of uncontrolled reaction depicted as "warp core breach", which shows a number of parallels to properties of modern day nuclear power plants. On the other hand, warp systems are typically explained as reaction chamber for matter-antimatter annihilation, which makes them a very powerful battery rather than a primary generator of energy. This raises the question how the energy for generating the antimatter was produced in the first place. An investigation on the required power vs. the available power on a planet such as Earth reveals a big gap between *Star Trek* fiction and possible reality. Furthermore, we will analyze the energy and power requirements of an exemplary *Star Trek* spaceship with a focus on the impulse propulsion system. Based on this analysis we will elaborate the properties of an energy system that is able to fulfill these requirements and look for promising technologies allowing the realization of such a system in the future.

Keywords

Energy · Power · Nuclear energy · Renewable energy · Smart grid · Spaceship propulsion

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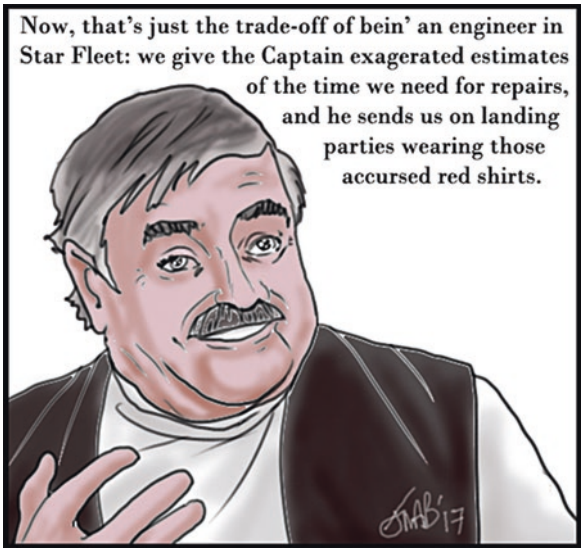


Editors' Log: Chapter 06

Energy systems are frequently mentioned in *Star Trek*, underlining the idea of how important they must be for the survival of humans in space. Almost everything, life support systems, replicators, holodecks, propulsion, shields and weapon systems, depends on the availability of energy systems. We can easily relate to that since – with the probable exception of life support systems – energy systems are equally important in our everyday lives. Wilfried Elmenreich is not only a Trekkie, but also a professor of smart energy grids. In this chapter he takes a look at the energy sources featured in *Star Trek* and invites the reader to don the blue shirt and calculate the amount of energy needed to operate a starship like the *USS Enterprise*. (**Eds.)**

***Star Trek: The Original Series*, 01×16, "The Galileo Seven" (1967)**
***Scott**: I can adjust the main reactor to function with a substitute fuel supply.*
***Spock**: That's all very well, but we don't have a substitute supply.*
***Scott**: Aye, we do. Our phasers. I can adapt them and use their energy. It'll take time, but it's possible.*

***Star Trek: The Next Generation*, 05×17, "The Outcast" (1992)**
***Riker**: If we just sit here, we'll lose all of our systems within an hour, including life support. Okay, I'm rerouting the propulsion system to the transporter. Re-channel the navigation systems. Let's transfer every microjoule of energy we've got. Sensors, life support. This might give us one last shot.*

(continued)

***Star Trek: Voyager*, 04×18, "The Killing Game" (1998)**
***Kim**: Look, holodecks require a tremendous amount of energy. I've already rerouted power from all nonessential systems. Anything more, and we'll start losing propulsion, deflectors, even life support.*

The Use, the Need, and the History of Energy

Despite the fact that food is energy and, thus, every organism needs energy, there is a special technical domain for humans regarding use and dependency on energy generation and storage. Since the first use of fire, the utilization of different energy forms have allowed us to operate independently of daylight time and to increase efficiency of production. However, the demand for energy has usually grown as fast as the availability of new energy sources, which means that there was hardly a time or place where energy was too abundant. In contrast, energy resources have been a topic for war even in the last decades. Such an important topic has also been treated well with the *Star Trek* series, which allows us to reflect upon our current and future energy systems through the *Star Trek* lens. In the next sections we will investigate on the view on energy given by *Star Trek* followed by a discussion how well this view could become an actual future. We will further see that it can be an interesting exercise to apply math and physics methods to analyze the *Star Trek* universe and derive concrete non-fictional ideas for our future.

Data: Core shutdown is unsuccessful. We are losing antimatter containment.
LaForge: We've got to eject the core!
Data: Ejection systems offline. Core breach is imminent.
Picard: All hands abandon ship. Repeat, all hands abandon...
Annotation: (KaBOOM!!!!) [1]

Energy in *Star Trek*

Star Trek depicts energy generation in the warp system and its transportation across the ship, and several usages by respective installations or devices. The key component is the fictional warp core which powers the starship's warp drive but also generally serves as power plant on the ship. Descriptions of the processes in the warp core typically involve a matter-antimatter reaction, which makes sense from the point that antimatter provides the highest density for an energy storage. However, antimatter typically needs to be produced in a sumptuous, energy-intensive process, unless there is a way to produce it on-board. From a physics perspective, production on the fly will be nearly impossible since energy cannot produced on the spot but only can be converted from one form to another one. The *Star Trek* writers tried to evade this problem by introducing a hypothetical quantum charge reversal device,

which is able to flip the charge of elementary particles, so making for example an anti-proton from a proton [2]. However, the *Star Trek: The Next Generation: Technical Manual* [3], which is detailing the technology of the fictional *Star Trek* universe additionally states that production happens in minute amounts.

> Spock: Two parallel universes project this. One positive, the other negative. Or, more specifically, one matter, the other antimatter.
> Kirk: Do you know what you're saying? Matter and antimatter have a tendency to cancel each other out. Violently.
> Spock: Precisely. Under certain conditions, when two identical particles of matter and antimatter meet. [4]

Another plot idea would be to depict a warp drive as a device that pulls it fuel from a parallel antimatter universe. While this explanation is not used in *Star Trek*, the idea of a parallel antimatter universe has been explored in a *TOS* episode where Kirk and his crew close a passage to an antimatter universe [4].

Without these plot devices, it would be necessary to refuel with fresh antimatter every now and then in order to sufficiently power a starship. Refueling is a process that is not emphasized in the *Star Trek* universe, so probably the amount of required antimatter is so small that we do not need a tank to be filled. This boils down to the question:

How much energy is needed and used by a starship like the Enterprise?

Now let's think like an engineer and get the numbers about energy storage and consumption as close to a realistic scenario a possible. Since we do not have much information about the efficiency of the starship's devices and appliances, giving an exact number is guesswork. Their communication and transportation system might be much more efficient than the ones we are used to. The same holds true for their computers, tablets and installations like holodecks. These systems could be very efficient. But there is one device that allows us to make a ballpark guess about the maximum power and energy of the starship – its propulsion system. Propelling a large spacecraft is an incredibly energy-intensive task. Assuming a physically feasible propulsion system, such as the impulse drive we can get a good estimate of the amount of energy that would be required. For this, we need a simple formula:

$$E = ½ m v^2,$$

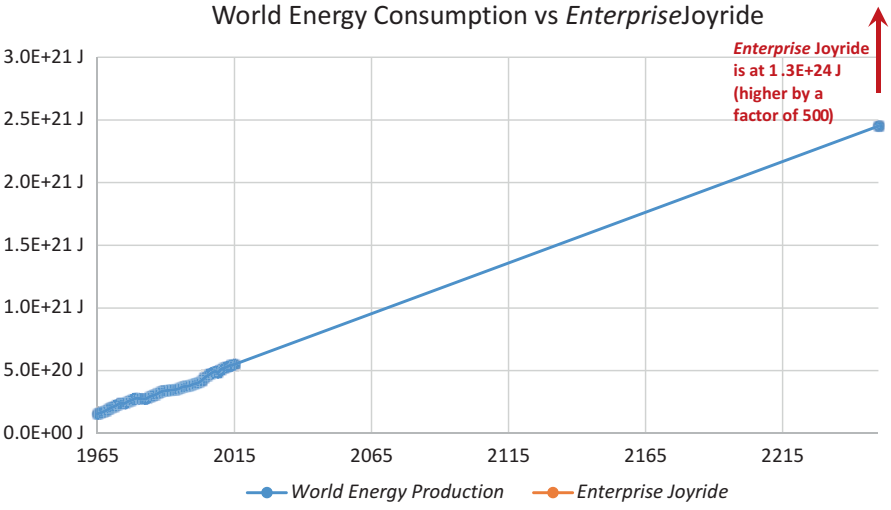
where m is the mass of the spacecraft and v is the speed.

> Paris: Your impulse drive is a real beauty.
> Irina: I designed it myself.
> Paris: But I couldn't help noticing your warp system seems so rudimentary. [5]

Getting close to the speed of light would require a correction factor, but for now, we will stay out of trouble with the light speed limit. There has been a discussion in the scientific community about the weight of the *Enterprise*, which gives us a

citable source for the first parameter here. Allain [6] estimates the weight of the *Enterprise* based on images from movies and the series. As a result, he gives a total volume of 5.94×10^6 m^3 and a density of 78 kg/m^3. This is a very low density comparable to Styrofoam, so we end up with 463 million kg as weight for the *USS Enterprise* (NCC-1701).

Now let's assume we want to accelerate this ship to 25% of the speed of light using the impulse drive. This is a maneuver performed often in the series and it never appears to be a very demanding task. The energy demand for a single acceleration is thus 1.3×10^{24} J. For comparison, the overall world's annual energy consumption (and production) in 2015 was estimated with 5.5×10^{20} J [7]. Even if we assume that the world energy production continues to grow like it has in the past decades, we would be short be a factor of 500 in the year 2250 (this is when large Constitution class starships like the *Enterprise* are entering service according to the series). In other words, we would need the energy of at least 500 Earths to get the *Enterprise* started.



How could we store such amounts of energy?

In a jet, this would require fuel with a weight of 60 million times the weight of the starship. This would not only look very ugly (the fuel tank would be also a couple of million times larger than the ship), but also is unfeasible since we need to consider that the fuel mass itself needs to be accelerated, thus we would need even more fuel. This is a common problem in today's spaceflight with accelerations to much lower speeds. Therefore, we need a more compact fuel.

Antimatter comes with a much higher energy density. In fact, it provides the maximum possible energy density since all antimatter and respective same amount of matter are converted to energy upon reaction. The reaction of 1 kg of antimatter

with 1 kg of matter would produce 1.8×10^{17} J [8]. This is approximately the amount of energy yielded by the largest thermonuclear weapon of our time.

When considering our first number on the required energy to accelerate a large starship, we can calculate a demand for 7.24 million kg of antimatter. In case, we are not able to use the generated energy with 100% efficiency, even more.

Now, it strikes me as odd that there are no scenes of the *Enterprise* refueling with large amounts of antimatter. A much bigger problem arises when we ask where we would get the energy for the antimatter in the first place. Today's world energy production equals to the value of 3000 kg antimatter. However, this does not mean that we are able to produce that amount of antimatter. Moreover, the 3000 kg are far from the required amount for taking the spaceship on a short joyride. Note that we tried to keep all values close to the optimum: we used a very light spaceship and assumed a perfect exploitation of energy from antimatter. So, by looking at the demand of the propulsion system we have to conclude that a spaceship able to accelerate with an impulse drive to a significant fraction of the speed of light is highly unrealistic from an energy point of view. On the other hand, it would explain why the overall use of energy seems to be less regulated on board the *Enterprise* – there is no need to care about energy use if your devices have a power demand that is insignificant compared to the consumption of the impulse drive.

Energy Production and Consumption Through the Lens of *Star Trek*

There are at least two lessons that can be learnt from calculating the energy demand based on a starship in *Star Trek*. First, the amount of energy required to propel a spaceship is likely to be grossly underestimated in almost all science fiction works. The other lesson is about helping us to think of a world with future energy systems and their possible properties. *Star Trek* points out two major aspects regarding their energy system. First, it assumes that there will be a technology in the future that will provide energy abundantly. Second, this energy source will also be potentially dangerous. From our current situation, these two points seem to stem from a rather outdated view. When *Star Trek* was conceived in the 1960s, there was the prevalent idea of harnessing nuclear energy for the good and subsequently providing clean, cheap energy for everyone. The second aspect of this energy source being potentially dangerous also fits this view very well. Just replace "warp core" with nuclear reaction chamber and we get a system that is powerful but potentially dangerous.

In contrast, today's energy system (as of 2016) is in a transition from old, "bad" forms of energy generation to new sustainable forms, mostly wind and solar power. Nuclear energy production is heavily contested and countries like Germany are going to close all their nuclear power plants in the coming years. In order to compensate for the loss of generation capacity, Germany has invested strongly into power from photovoltaics and wind. However, due to the fact that electric energy is difficult and costly to store, balancing the grid between weather-dependent production and a given demand becomes more difficult. Interestingly, this leads us to a

situation where we have to invest more care in our energy system than was previously required. Time-based tariffs and demand response systems urge the consumer into a more energy-aware behavior, which is much different from the situation depicted in *Star Trek*.

A more *Star Trek*-like energy future is envisioned with fusion nuclear power. In a fusion reactor, the atomic nuclei of a light element such as a hydrogen isotope are fused into nuclei forming a heavier element such as helium. Nuclear fusion processes already take place in the Sun's core, but these conditions are significantly harder to recreate and maintain on Earth. For this reason, today's nuclear fusion reactors hardly produce more energy than they use initiating and containing the fusion process.

Looking into the basics of a fusion reactor, we find a lot of terms that sound like *Star Trek* jargon: plasma, containment field, core, poloidal magnetic field, etc. Furthermore, a compact nuclear fusion system is expected to become a major boost in space travel [9].

Unlike nuclear fission, a nuclear fusion reactor is expected to be less susceptible to a runaway process that would melt the core and its surroundings, releasing a hazardous amount of nuclear material. This is in contrast to the depiction of the warp core in *Star Trek*, which, although mostly as a plot vehicle, often creates problems and significant hazard. This view might be less outdated than it seems, considering that handling large amounts of energy always come with potential risk.

How much risk and hazard will come with a future fusion reactor is hard to estimate, since we are missing the working prototypes today. Overall, it will take several decades until nuclear fusion becomes usable.

In an interesting coincidence, the development of the Warp drive in the *Star Trek* universe is said to have happened sometime around 2063 – see *Star Trek VIII: First Contact* (*ST:VIII*) [10] – a date that could be in line with predictions for the development of the first compact fusion reactor.

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"My People once lived in Caves": Pre-modern Societies in *Star Trek*

Christian Domenig and Stefan Rabitsch

Abstract

Encounters with pre-modern societies are a popular *topos* in *Star Trek*. Starfleet's intrepid explorers often make contact with worlds devoid of industry, electricity, and contemporary as well as futuristic comforts. Etymologically, the term *pre-modern* points to its root in ancient Greek – *oikos (οϊκος)* – which encompasses the family, the household, and property as well as the domicile itself – all headed by a chief called *pater familias* in Latin. Secondly, pre-modern refers a society whose everyday life is greatly influenced by (dogmatic) religion. And finally, the term connotes a society's high dependency on agriculture. In the *Star Trek* universe, interactions with pre-warp civilizations are regulated by the *Prime Directive*, which actually prohibits any interference with such cultures. By reason of exigencies and for dramatic purposes, this *Starfleet General Order 1* is often violated. Tapping into the didactic potential of example episodes and movies, this chapter discusses such violations vis-à-vis the images of pre-modern societies, which specifically refer to the Middle Ages. Ultimately, this chapter pursues a question central to the philosophy of history and the teaching thereof: Is the history of mankind paradigmatic for the whole universe?

This chapter is based on original work presented by Christian Domenig in his lecture "Auch wir haben einmal in Höhlen gelebt: (Vor-)Moderne Gesellschaften und politische Systeme im Star Trek-Universum", which was part of an interdisciplinary lecture series on Star Trek co-organized by Stefan Rabitsch and Martin Gabriel in the fall term of 2015/16 at Alpen-Adria-Universität Klagenfurt. Rabitsch then collaborated with Domenig in translating and transforming the lecture into a publishable format in English.

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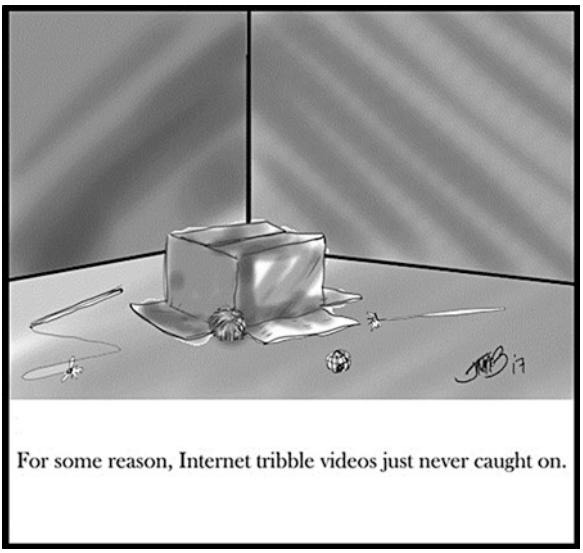

Editors' Log: Chapter 07

Detecting a sharp increase in chronitons. Temporal displacement immanent. There are no signs of industrialization. Though set in outer space in the distant future, *Star Trek* is essentially a tapestry of human history, especially the historical past. How else do you think we can make sense of, and give meaning to, the imagined alien 'Other' if not by referring back to our own past? This is how a medievalist and historian like Christian Domenig, teaming up with the American Studies and science fiction scholar Stefan Rabitsch, enters the twenty-third and twenty-fourth century. We might not readily think about them at first, but *Star Trek*'s intrepid explorers encounter many *pre-modern societies*. They bring to the fore many of the changes in societal structures, epistemology and thus cosmology which we who live in (post)modern societies have long since taken for granted. (**Eds.)**

(continued)

***Star Trek: Enterprise*, 01×09, "Civilization" (2001)**
Travis: *Should we hail them?*
Hoshi: *Who? I'm picking up dozens of cities on each continent.*
Archer: *Let's hold off a second. We don't know whether they're using high-band frequencies or smoke signals.*
T'Pol: *The latter's more likely. I'm not detecting any EM transmissions.*
Tucker: *Pre-industrial?*
Archer: *Let's take a closer look. Do you see that, just off the coast?*
Hoshi: *I've got it.*
Tucker: *Looks like an old clipper ship.*
Archer: *It's almost like travelling back in time.*

Introduction – "[O]n its way to rendezvous with history"

Star Trek refers more often to the history of mankind than most people would expect [1]. When we think of images of historical periods that diverge from the futuristic twenty-third and twenty-fourth century presented in *Star Trek*, we are bound to first think of time travel scenarios. After all, journeys through time are an important element in *Star Trek* even if scientists today, and Vulcans in the twenty-second century, are doubtful about their feasibility and even possibility [2]. Best known might be the time travel romp *Star Trek IV: The Voyage Home* (*ST:IV*), where Kirk (William Shatner), Spock (Leonard Nimoy), and the crew of *Star Trek: The Original Series* (*TOS*) transport two whales from 1986 to the twenty-third century to prevent the destruction of Earth by an alien vessel [3]. The movie *Star Trek: First Contact* (*ST:VIII*) also comes to mind. Captain Picard (Patrick Stewart) and the crew of the *Enterprise-E* travel back to 2063 to ensure the peaceful first contact between humanity and the Vulcans and to prevent the assimilation of Earth by the Borg [4]. The reboot film *Star Trek* (2009) also begins with a disruption of the timeline triggering an alternative course of history. Not only is Spock catapulted from the twenty-fourth to the twenty-third century in this version of history, but so is his adversary Nero, who nearly prevents the birth of James T. Kirk in 2233. When the planet Vulcan is destroyed 25 years later, an alternative era had definitely begun [5]. Time travel narratives are a widely-used trope in *Star Trek* not least because they are a convenient tool to revisit the audience's 'primary reality'; often with tongue in cheek. For example, the crew of *TOS* travelled to twentieth century New York City to ensure the entry of the United States into the Second World War [6]. One episode of *Star Trek: Deep Space 9* (*DS9*) reframes the Roswell UFO incident as the result of three Ferengi's accidental journey through time [7]. On one occasion, the *USS Voyager* even ends up in 1996. In this timeline, the megalomaniac CEO of *Chronowerx Industries* led a computer revolution made possible by technology he stole from a twenty-ninth century timeship [8]. Hence, the technological innovations he fueled at the end of the twentieth century should not have happened this way; it falls to Captain Janeway

(Kate Mulgrew) and her crew to set the historical record straight. While not recorded in the history books, the first extraterrestrial influence on human history occured in 1666 when a godlike Q (later known as Quinn) drops an apple on Isaac Newton's head, prompting the latter to formulate the law of universal gravitation [9].

While time travel extravaganzas abound in *Star Trek*, there is also a plethora of different yet potent and instructive images of history embedded in the universe of the twenty-third and twenty-fourth century – the seemingly countless pre-modern societies that dot many worlds. Usually, Starfleet does not get in contact with pre-modern societies by way of time travel stories. There are many cultures in the *Star Trek* universe that have not yet reached a technological level sufficiently advanced, for example, for space flight or even industrialization. A staple in the *Star Trek* universe, they also make for a great teaching device.

Pre-modern, Modern, Postmodern – Where Do Historians Draw the Line(s)?

What exactly does the term *pre-modern* actually mean in historical terms? Even though the terms modern, postmodern, and pre-modern are widely-used, their definitions often tend to be elusive and/or are marred by intense scholarly disputes. Each term essentially presupposes the question of whether the best times, i.e. some sort of 'Golden Age', are already behind us, ahead of us; or, if we actually already live in the best of all times. This dispute first took place in France at the end of the seventeenth century when Louis XIV, the 'Sun King', was absolute ruler of the country. Contemporary scholars compared his reign to the 'Golden Age' of the Roman emperor Augustus. The ensuing scholarly debate became known as the *Quarrel of the Ancients and the Moderns* (*Querelle des Anciens et des Modernes*). What fuelled it was the basic question of whether or not the Greeks and Romans had reached the highest level of sophistication in the arts and letters. Scholars raised the question of whether everything should (and even could) be measured in comparison to ancient ideals. In this quarrel, Charles Perrault, who invented the literary genre of fairy tales and who also wrote *Little Red Riding Hood* (1697) as well as *Cinderella* (1697), provoked the exponents of the Ancients by stating that "c'est nous qui sommes les Anciens" ("we are the Ancients") [10, p. 33]. He combined the term *modernity* with a historical theory. As the arts of rhetoric, poetry and science evolve along similar lines to ever higher levels of sophistication, they correlate with a general progress of (human) civilization [11 p. 11]. By comparing 'now' and 'then', new benchmarks were developed in that the present discovers itself to be more and more different from its antecedents [12]. Consequently, modernity also means an emancipation from tradition and ancient authorities.

In the decades following the dispute in France, this theorem was discussed all across Europe. Established by Jonathan Swift at the beginning of the eighteenth century, the dispute was called the *Battle of the Books* in England [13]. At the end of the century, the debate finally reached Germany. There, it was Friedrich Schiller and his counterpart, Friedrich Schlegel, who continued the dispute by shifting its

main focus on art history. A representative of Early Romanticism, Schlegel argued that ancient art is idealistic and bound to beauty. According to him, modern art is subjective, i.e. it has special interests and a purpose [14, p. 134]. On the other hand, Schiller, who was an exponent of *Weimar Classicism*, thought the ancient primacy of beauty had been replaced by morality. While ancient art imitated nature, modern artists added idealism to their work [15].

Starting in the 1950s, (arts) scholars came to the consensus that we do not live in modernity anymore. Since then, contemporary history is called postmodernism, which is sometimes also referred to as second modernity. The historian Lothar Kolmer even argues for the term post-postmodernism, aiming to incorporate the fact that history is changing and growing every day. Moreover, the *Weltgeist* – a concept established by the German philosopher Georg Wilhelm Friedrich Hegel in the nineteenth century to explain the universal progress of history – fell out of favor with historians who acknowledged and embraced the plurality of histories. Consequently, various *-isms* have come and gone. On the one hand, they often seem to be present simultaneously while on the other hand they can quickly fade in and out of use. The era of post-postmodernism is thus marked by considerable confusion and a simultaneity of various theories – a comprehensive theory of everything is no longer possible [16, p. 94]. Constructivism, the narrative paradigm, and intertextuality have also become *passé*. However, we have to consider and remind ourselves that people tend to perceive the present as confusing and disorganized, while the past seems to be well-ordered and uncomplicated.

Even though it does not denote a certain age, the term pre-modern describes the long era that came after antiquity and before modernity. Historians generally agree on two major turning points that are paradigmatic of this era: (1) the period at around 1500, and then again (2) around 1800. Most definitions locate pre-modernity in the time before 1800. Dietrich Gerhard, for example, argues that the era between the eleventh and the eighteenth century "should be regarded as one unit, as the period of the 'Old Europe'. The 'Old Europe' should be interpreted as a civilization which, thought far from static, balances the forces tending in the direction of change, of centralization, of equality, by the power of tradition, by strong regional and local attachment, by the corporate setup of society" [17, p. 903].

What does a pre-modern society look like? The absence of industrialization is a pre-modern society's most obvious characteristic. Yet, there are three additional attributes that are key:

1. An essential term for the pre-modern era is *oikos* (ancient Greek: *οἶκος*). It encompasses the house, the family, and the family's property. Let us not forget, the terms economy and ecology also derive from *oikos*. The pre-modern household is headed by a *pater familias* with everybody belonging to a *House*. While different forms of lordship extend vertically from a *House*, the neighborhood forms a social circumference along horizontal lines. The rise of the nobility is the result of houses being assigned different ranks. This kind of social system is called feudalism. It works by way of the distribution of benefits to dependents.

In other words, it amounts to a socio-economic network structure headed by a distributor who assembles vassals with redistribution rights and duties.
2. Religion and society are closely interlaced in pre-modern cultures. There is no separation between church and state. This has a significant effect on the education system and even the sciences. The whole world, i.e. the cosmos, is explained with religious dogmata which are not to be doubted or questioned.
3. Pre-modern societies are inextricably dependent on agriculture. People believe in the rule of nature. The natural environment is seen and understood as god's creation. It is god who either rewards people with good harvests, or punishes them with crop failures, cataclysms, or climate change.

Various elements of pre-modern societies appear in *Star Trek*. For example, the Klingons essentially live in a feudal society. They have *Great Houses* that are always led by the eldest male. This system of inheritance is called agnatic seniority [18]. Religion and its representatives, e.g. priests called *vedeks*, or monks variously called *ranjen* or *prylar*, have a strong influence on the Bajoran state and society. While latent pre-modern aspects inform some spacefaring cultures, warp-civilizations are normally secular; they are built on high-tech industrialization and advanced agriculture which makes them less prone to the effects of *lusus naturae*, i.e. the vagaries of nature.

Pre-modern Societies in *Star Trek* – "It was my first visit to a pre-warp culture"

Pre-warp civilizations, however, illustrate the aforementioned characteristics best. Contact with these people is regulated by the *Prime Directive*, also known as *Starfleet General Order 1*, or *Non-Interference Directive*. As long as civilizations cannot travel through space faster than the speed of light, they should be protected from any external influences. The *Prime Directive* states that these cultures should not be disturbed in any way so that they may develop at their own 'natural pace'. However, this law is violated more often than not.

The *Star Trek: The Next Generation* (*TNG*) episode "Who watches the Watchers" is a paradigmatic example. It explains the struggle between logical and mystical explanations of the cosmos [19]. The *Enterprise-D* visits Mintaka III where anthropologists covertly observe the Mintakans, a pre-warp civilization who is distantly related to Vulcans. On the one hand, they appear to be at a Bronze Age level of development, while on the other hand they are also reminiscent of a society at the dawn of the Enlightenment. Due to a malfunction, the outpost, which was hidden by a holographic duck blind, becomes visible for a short time. Liko, one of two Mintakans in the area, is hurt and Dr. Crusher (Gates McFadden) has him beamed to sickbay. There, Liko briefly regains consciousness and sees Captain Picard giving orders. He believes '*The Picard*' to be a godlike entity. Back on the planet, Liko remembers old myths about higher beings ruling nature and society. A wise old man recalls and recounts the legend of '*The Overseer*'. The story was relativized over the

years but now some of the Mintakans begin to think it could be true after all. Picard is said to be the *Overseer*, who has a lot of servants. Hence, the Mintakans may revert to their spiritual beliefs even though they show traits similar to those exhibited by early Vulcans. Captain Picard decides to take Nuria, the chief of the Mintakans, to the *Enterprise* to disenthrall her from her beliefs. This nearly ends up in a fiasco because even doors seem to follow Picard's commands. The captain explains to Nuria that humans once also lived in caves, and progressed to a higher technological level which might seem like magic to her people. When she witnesses the death of a human crew member, Nuria understands that Picard is not all-powerful and his crew are not divine beings. The captain returns to the planet with Nuria to explain his mortality to the Mintakans, and finally proves it when he is wounded by an arrow. It is then clear even to the staunchest believers like Liko that Picard is not the '*Overseer*'. By way of what are occasionally heavy-handed allegories, the episode effectively illustrates and condenses the paradigmatic shift from a pre-modern to a modern society and worldview.

The Boraalans become victims of another accidental interference by Starfleet in the *TNG* episode "Homeward". Lt. Worf's (Michael Dorn) brother Nikolai, who works undercover as an embedded anthropologist, observes this pre-warp civilization. The *Enterprise-D* is called to their planet because it will become uninhabitable due to atmospheric dissipation. Nikolai wants to rescue the Boraalans, but Captain Picard cites the *Prime Directive* and refuses his request. Nikolai simply goes ahead without permission and transports the people to the holodeck. There, he and Worf stage a journey to a new settlement, but the holodeck begins to malfunction, jeopardizing their efforts. Along the way, Worf talks to the Boraalan chronicler Vorin about the teaching of history. When Worf tells him that in his village they use stories and songs, Vorin replies, "stories change with each person who tells them" [20]. Characteristically, pre-modern societies are located at the intersection of orality and literacy. In the records of the European Middle Ages this fact is well attested to especially in deeds from the thirteenth century where the following phrase often appears: "scriptura maneat" – writing remains, while witnesses die. Soon after this scene the chronicler Vorin accidentally wanders off the holodeck and steps into the twenty-fourth century. Since he will never be allowed to see his people again, he becomes so desperate that he performs ritual suicide.

There is another example that was lifted straight out of the European Middle Ages. In the *TNG* episode "Thine Own Self", Data (Brent Spiner) crash-lands on the planet Barkon IV. Suffering from 'amnesia', he enters a town carrying a case containing radioactive material [21]. Over the course of his stay, people become seriously afflicted by a strange sickness. Since the illness began to spread after Data's arrival, he is made responsible and subsequently lynched by a mob. A character named Talur is of great importance in the episode. She is the town's resident teacher, scientist and physician, and as such appears to be a rational person propounding logical thinking. When she examines Data, she classifies him as an *iceman* assuming that he must be coming from colder climes. She argues that his pale skin is evidence for that. According to her, the people Data belongs to are used to fight with wild beasts which serves to explain as to why he is exceptionally strong. In the next

sequence, she teaches her pupils the basic elements of the universe: rock, fire, sky, and water. They are found in all objects. Hence, the rock in wood can be felt in the latter's weight and hardness. Wood shows fire when exposed to a flame and the smoke rising out of that is a part of the sky. Water is the only element that is difficult to see in wood. Data intuitively disagrees.

Talur essentially explains the pre-scientific concept of the four classical elements: earth, water, air, and fire. Four qualities were assigned to those elements: warm, cold, dry, and moist. We find so-called *humors* that correspond with these elements already as early as in Antiquity – *blood* (air, warm and moist), *black bile* (earth, cold and dry), *yellow bile* (fire, warm and dry), and *phlegm* (water, cold and moist). According to ancient knowledge, the entire cosmos consists of a combination of these four elements. Another belief that informed early science was that the microcosm is mirrored in the macrocosm, and vice versa. This traditional doctrine prevailed throughout the Middle Ages. The theory is so general that it was also used in medicine. According to the four elements, sickness manifests as dyscrasia, i.e. a wrong mixture of humors. If they are not in an equilibrium, people would feel cold, hot, soggy or dehydrated, respectively. Based on the principles of the Hippocratic Corpus, scholars built a system of colors, organs, seasons, age, and signs of the zodiac. The Greek physician Galen of Pergamon is believed to be the founder of humoralism. The balance between the humors determines the appearance, character and sickness of a person. Consequently, there are four temperaments: (1) sanguine (sociable, lively, frivolous), (2) choleric (impulsive, excitable, imbalanced), (3) melancholic (adust, suspicious, serious), and (4) phlegmatic (inward, patient, sluggish). The theory was expanded to include a model of organs that produce these humors. The liver makes blood from digested nutrients which is required by all organs. Fluids like urine, black and yellow bile generate abscesses or pyrexia. If a person was sick, it was the duty of a physician to re-establish balance between the humors. Following the theory of humoralism, Talur thinks that liquids in the body are heated. When people develop a fever due to radiation exposure, she concludes that is necessary to cool down the body. Data, on the other hand, examines the radioactive material and tries to solve the problem in a thoroughly scientific manner by way of experimentation and observation.

The civilization of the Akaali displays a similar pre-industrial level of development in an episode of *Star Trek: Enterprise* (*ENT*) [22]. The Akaali homeworld is divided into continents. Dozens of languages are spoken on the planet. It is an urban culture with farms on the outskirts. In the city, water wells, carts and wooden barrels can be seen. Streets are lighted with Residic oil and houses are built from stone and wood. People on the planet are armed with tiny crossbows that can be shot with one hand. The scenery looks a lot like a town in Europe during the Renaissance. Captain Archer (Scott Bakula) is interested in the planet because of low-level neutrino emissions—an unusual discrepancy for such a civilization. Once down on the planet, he learns that people suffer from a strange illness that causes lesions. While working towards a cure, the pharmacist Riaan discovers a correlation; the malady began when a foreign merchant came to town. Similar to *TNG* "Who Watches the Watchers", this episode illustrates the historical transition points where modern

sciences and scientific thinking emerged. In the end, Archer finds out that the stranger who came to town is actually an alien visitor who operates an antimatter reactor in his cellar thereby contaminating the surrounding area.

The crew of the starship *Voyager* was even able to observe the complete development of a civilization in the episode "Blink of an Eye" [23]. They discover a planet where time passes much faster on surface than in space. The ship is trapped in a gravimetric gradient and becomes stuck in orbit. At the same time on the planet, we see a Stone-Age man preparing an altar. Suddenly, an earthquake occurs, and in the same moment a new star appears in the sky. This new star, *Voyager* known as 'Ground Shaker' on the planet, also shines during the day. This coincidence prompts people on the surface to construe the phenomenon as the arrival of a new god. Adoration and worshipping start almost immediately. From then on, *Voyager* is an integral part of the planet's mythology, history, and teleology. Meanwhile, the crew is enthusiastic about being able to observe the development of a whole civilization in fast-forward. Commander Chakotay (Robert Beltran) and B'Elanna Torres (Roxann Dawson) discuss whether the people on the planet will choose the Klingon or Human way of progress. The second scene on the planet already represents the late Middle Ages. We can see castles and a so-called Protector, a person like a lord, who dictates a letter. By way of a hot-air balloon, he intends to send a petition to the Ground Shaker asking it to stop the frequent earthquakes. The Protector even believes that the universe is actually populated. In the next scene, *Voyager* can be seen from the planet with a telescope and the inhabitants try to send a message of prime numbers to the spaceship. In the end, the people on the planet even develop space flight and missiles. The episode provides a condensed and easy-to-access model that showcases the belief in the linear teleology of civilization that has dominated western historiography.

Star Trek also offers a few instances of societies that regress deliberately to an earlier level of development. After nearly annihilating themselves in a war in the twenty-first century, the Ba'ku decided to withdraw and settled on a world in the *Briar Patch*. On this planet, eternal life is possible thanks to metaphasic radiation produced by the rings of the planet. While the Ba'ku consciuosly gave up technology in everyday life, the Federation anthropologists, who observe them in secret, think they are a pre-industrial civilization. Anij, a leading member of the Ba'ku, asks: "Where can warp drive take us except away from here?" [24] In their village, they practice agriculture and crafts so they evoke the impression of an ideal type of a pre-modern society.

Conclusion – "I don't know who writes your history books"

In the *Star Trek* universe, we are presented with humanoid people progressing along similar, and mostly linear lines. The common model follows the following stages – there is a mystical antiquity which is followed by stages of Enlightenment and modernisation, crisis, and space flight. While perhaps problematic in that it is presented as normative, *Star Trek* is an ideal vehicle for illustrating how western

historiography has recorded and classified different stages of 'civilization'. Is this the only way we can describe history? Is the aim of every civilization to conquer the universe? Predetermined history is still very popular. According to the Judeo-Christian worldview, history starts with Creation and ends with the Last Judgement. Karl Marx speaks of a tribal society that anticipates communism, an ancient society of slaveholders, feudalism based on serfs, and capitalism exploiting the working class. Dictatorship is established by way of a proletarian revolution, followed by socialism and then communism advances society. Consequently, history's purpose – its *telos* – is fulfilled. On the other hand, Oswald Spengler predicted *The Decline of the West* already after the First World War [25]. At the end of the twentieth century, Francis Fukuyama exclaimed *The End of History and the Last Man* [26]. Even so, we have yet to witness an apocalypse, or some other event of cataclysmic proportions. In short, history is an open-ended process. Despite *Star Trek*'s efforts to 'record' a history of the future, and along with it the histories of many alien societies, the future simply is not yet written.

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"Ready To Beam Up": *Star Trek* and its Interactions with Science, Research and Technology

Joachim Allgaier

Abstract

Star Trek has been popular not only with various international audiences; in fact, it has become a sort of icon of popular culture. Its imagery, style and ideas have inspired and motivated many scientists, researchers and inventors. There have been numerous interesting and fruitful interactions between the real world of science and research and *Star Trek*'s fictional world. This contribution investigates how various researchers, scientists and research institutions have referred to *Star Trek* in their work and how ideas and particular aspects and technologies of the *Star Trek* universe have been used in public science communication. *Star Trek* technology was also used as reference point to ignite innovation. For instance, in early 2017, the Qualcomm Tricorder XPrize competition awarded more than $10 million in prizes to teams that attempted to make real-world, non-invasive, diagnostic devices inspired by the *Star Trek* tricorder. The chapter also explains how NASA teamed up with some of the actors from *Star Trek* in order to engage with various audiences, and even to recruit young astronauts. *Star Trek* provides many opportunities to study the interactions between science, research and popular culture.

Keywords

Science communication · Popular culture · Science and society · Science to public · Science fiction · Innovation · Science and technology studies · *Star Trek*

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While it is common for television shows to include new technologies, there are fewer examples of shows inspiring research and development in scientific fields like physics, medicine or computer science. *Star Trek*, however, is one of the best examples for such a case. Individual scientists and entire institutions tackled research projects based on the premises shown in *Star Trek: The Original Series* (*TOS*) and its spin-offs. Joachim Allgaier shows that, on the one hand, there are many interactions between scientific research and *Star Trek*, and that, on the other hand, in their public relations/science-to-public activities, institutions like NASA or scientists like "Mr. Beam", Anton Zeilinger, quite openly refer to the inspiration *Star Trek* provided. (**Eds.)**

***Star Trek: Voyager*, 03×07, "Sacred Ground" (1996)**
Guide: *That device you've got, what is that?*
Janeway*: It's called a tricorder.*
Guide*: A tricorder. What exactly does a tricorder do?*
Janeway*: It's a scanning device.*
Guide*: Interesting. May I? Ah, atmospheric reading, energy field analysis, full technical database. This is certainly a convenient thing to have.*

Science, Research and Popular Culture

The image that many members of the public have of science, research and technology is influenced not only by formal science education in school, and by what they hear about these topics in journalistic media. They are also influenced by images in entertainment media and, more generally, by popular culture. Images and ideas from the fictional universe of the successful *Star Trek* TV series and movies seem to emerge particularly often when news about science, technology and research are covered. This chapter[1] investigates how and why the *Star Trek* universe is often used as a reference point in public science communication, and also consequently demonstrates how some ideas from this fictional entertainment program were used to stimulate actual research in the real world.

First of all we find a high affinity and openness to ideas and concepts from the academic world in the *Star Trek* universe. In contrast to other science fiction universes such as the popular *Star Wars* franchise, *Star Trek*'s plots and ideas are focused more strongly on actual plausibility, for instance concerning the use of particular technologies. The Uncertainty Principle attributed to physicist Werner Heisenberg serves as a representative example here. The principle states that the more precisely the position of particular particles is determined, the less precisely its momentum can be known, and vice versa. In other words, it means that it is not possible to determine the position and the momentum of a quantum particle at the same time. However, it is exactly this quantum information that is needed to make "beaming", a technology for the teleportation of people and objects in *Star Trek,* possible. In order to circumvent this physical impossibility, the teleporter technology in *Star Trek* is equipped with a so called Heisenberg Compensator [1] to solve this problem in a "black-box" manner [2, 3].

Many *Star Trek* stories try to provide scientifically plausible speculation on how some of their fictional technologies might work. Even though this process involves considerable speculation, it contrasts with a more fantasy-based approach in other franchises. The stories in *Star Wars*, for example, focus more on moral and mythological aspects rather than technological plausibility, and often have more of an epic scope; they usually center on whether a particular character will be drawn to "the dark side" or to "the light side" of a moral divide.

[1] I am grateful to the editors of this book for their helpful suggestions, leads and thoughtful language and other revisions. Dr. Patricio Lopez (Jülich Research Centre Project Management Agency, Berlin) and Dr. Thomas Völker (European Commission Joint Research Centre, Ispra) deserve special thanks for their illuminating comments, recommendations concerning the literature, and for sharing their vast knowledge about the *Star Trek* universe and science fiction in general with me.

Star Trek as a Fictional Laboratory

The *Star Trek* universe can also be understood as sort of a fictional laboratory to experiment with diverse scenarios that are also discussed in the academic and scientific world. For instance, they consider what a modern society might look like and how it might work if there was no money. In fact, various philosophers, political and social scientists, lawyers and many other academics have written about the various worldviews [4, 5], political ideologies [6], and ethics [7] that are embedded in the *Star Trek* universe. Even some medical aspects of the TV program were discussed in scientific journals (e.g. [8]).

By the same token, engineers and scientists have investigated the inventions [9], technologies [10], and various natural scientific aspects (e.g. [11, 12]) of the *Star Trek* universe.[2]

Last but not least, various researchers from the social sciences and the humanities have investigated and studied the culture of *Star Trek* fandom [13], the audiences of *Star Trek* as a popular science fiction TV program [14], and the various tribes and subcultures that Trekkies [15, 16] have created and manifested around the world.

Star Trek and the Public Communication of Science and Technology

Working in the other direction, scientists and engineers have used imagery and ideas from *Star Trek* in order to explain their work to the public, and also in order to garner public attention via exposure through mass media. The Austrian physicist Anton Zeilinger, for instance, is an expert and pioneer in the field of quantum information and quantum mechanics (e.g. [17]). He is particularly well known for successful experiments he conducted with his team in which he successfully transferred quantum information, including quantum teleportation of an independent qubit.[3] This kind of scientific breakthrough can be difficult to explain to the general public. On several occasions and in various formats, Professor Zeilinger referred to *Star Trek*'s teleportation technology ("beaming up") in order to set a reference point.[4] He went on to use the *Star Trek* example in order to explain what might eventually be achieved in a distant future, and how his research might (or might not) lead the way to transporter platforms and instantaneous travel [18]. Finally, after building on this

[2] See also: Batchelor, D. A. (2016). The Science of Star Trek. *National Aeronautics and Space Administration (NASA)*. Retrieved from https://www.nasa.gov/topics/technology/features/star_trek.html.

[3] For the significance of his work see for instance: Schiermeier, S. (2005). Quantum physics: The philosopher of photons. *Nature*. Retrieved from http://www.nature.com/nature/journal/v434/n7037/full/4341066a.html.

[4] See for instance his team's contribution at the documenta 2012, an exhibition of modern and contemporary art which takes place every 5 years in Kassel, Germany: Rauner, M. (2012). "Mister Beam". *Die Zeit*. Retrieved from http://www.zeit.de/2012/24/Documenta-Zeilinger.

shared mental imagery, he was able to discuss his actual research and practical experiments (e.g. [19]).

Although his research does not directly relate to the technology used in the *Star Trek* universe, Anton Zeiliger often used images and other aspects from *Star Trek* at public events and talks.[5] Professor Zeilinger eventually became one of Austria's most well-known and popular scientists, and president of the Austrian Academy of the Sciences. In the popular media he is now known under his nickname "Mr. Beam".[6]

Let us consider another one of the many examples of how researchers use the popularity and prominence of *Star Trek* in their public science communication efforts. A team of engineers from Gdańsk, Poland, that works on 3D holographic display systems referred to *Star Trek*'s holodeck – a virtual space in which all kinds of environments and people can be simulated technologically – in a publicity brochure [20].

Star Trek as Inspiration for Innovation and Technology

Star Trek also introduced imaginary technologies that have come to be real life technologies later on. Examples are the cellphone and other mobile communication devices based on the communicator technology in *Star Trek*. Martin Cooper led an engineering team at Motorola that developed the world's first handheld mobile phone. Cooper said that he was inspired to develop a handheld mobile phone by watching Captain Kirk using a small communication device in *Star Trek* to communicate with his team and crew [21]. Another example is today's 3D–printing based on the idea of the *Star Trek* replicators, which could assemble almost everything, from various dishes and drinks, to pharmaceutical products, spare parts and custom made tools from various basic substances and particles [22].

In the *Star Trek* programs the protagonists do not use keyboards to communicate with computers, they simply talk to them. This idea has also inspired the current voice interfaces that are used in smartphones and other devices [23]. In the motion picture *Star Trek IV: The Voyage Home* (*ST:IV*), the formula for transparent aluminum is given to humanity so that they are able to build a particular whale tank, which plays a central role in the movie. Very recently a press release came out in which researchers said that they are now actually able to construct transparent aluminum [24]. Virtual reality interfaces and glasses that shall compete with the aforementioned holodeck in the near future are also on the way of becoming an affordable consumer technology these days [25], among various other technologies seen in *Star Trek*.

[5] See for instance: Zeilinger, A. (2014). Star Trek "Heisenberg Compensator". *YouTube*. Retrieved from https://www.youtube.com/watch?v=sysxnM279X0.

[6] See for instance: Lossau, N. (2013). "Mr. Beam" bekommt die Urania-Medaille. *Welt*. Retrieved from http://www.welt.de/wissenschaft/article121121994/Mr-Beam-bekommt-die-Urania-Medaille.html.

Fictional medical technologies and diagnostic devices presented in *Star Trek* have also gained a lot of attention in the health sector and elsewhere. For instance, it has been reported that a research team from Leicester University in the United Kingdom has developed a "*Star Trek*-style" medical suite that the Leicester Royal Infirmary uses in its Accident and Emergency Unit. The scientists involved said that the technology was pioneering and that the developments were inspired by diagnostics they had seen in *Star Trek* [26]. In *Star Trek* a (biological) sample usually was just "put into a machine" and almost instantaneously the medical staff received a very specific, multi-parameter-result. The real world development drives more and more into systems with a similar "usability". With new DNA-sequencers or the modern "lab-on-a-chip"-technology, real-world science moves constantly into this direction as shown in the *Star Trek* series.

The "medical tricorder" from *Star Trek: The Original Series* (*TOS*) is a fictional device which can be used to instantly and non-intrusively diagnose various ailments. This has currently become something of a holy grail in the health technology industry. The mobile communication giant Qualcomm referred to this hyper-functional non-invasive diagnostic tool in the Qualcomm Tricorder XPrize, a competition which offered a US$10 million Grand Prize, a US$2 million Second Prize, and a US$1 million Third Prize to the best real-world, portable, non-invasive medical diagnostic device inspired by the original *Star Trek* tricorder. Prizes were awarded in early 2017 [27].

Positive Role-Models Provided by *Star Trek*

It is not only the technologies and inventions presented in *Star Trek* that have inspired scientists, engineers and researchers, but also the characters, and the actors who portrayed them. Among many others Chris Smillie, a senior lecturer in Ecology and Environmental Management at Nottingham Trent University in the United Kingdom, reports that he was inspired to become a scientist by the half-human and half-alien *Star Trek* character Mr. Spock (Leonard Nimoy) [28]. The popular US astrophysicist and science communicator Neil deGrasse-Tyson, on the other hand, clearly favors Captain Kirk (William Shatner) as his main inspiration [29].

However, it seems fair to say that the biggest social and cultural impact was made by African-American actress Nichelle Nichols starring as Lieutenant Uhura who served as chief communications officer as a member of the multicultural crew of the *Enterprise* in *TOS*. It was in this role that Nichols made history as one of the first characters of African descent to be featured in a non-menial role on an American television series. Nichelle Nichols and the *Star Trek* character Lieutenant Uhura are said to have had an enormous impact on the representation of minorities in general and the uptake of science, technology, engineering and mathematics subjects of children from minority backgrounds in particular [30]. At the time, members of minority communities were not being represented fairly in the media, in education, in the skilled technical workforce, and certainly not in the forefront of the national space program. Nichelle Nichols wrote in her autobiography:

"There was no one in the astronaut corps who looked anything like me. There were no women, no Blacks, no Asians, no Latinos. I could not reconcile the term "United States space program" with an endeavor that did not involve anyone except white males. No offense to those fine, brave men, but if we in America tell our children they can be all that they dream, why weren't there women and minority astronauts? Thousands of fans wrote thanking me for Uhura's inspiration. Little Black girls and boys, Latino and Asian children had a legitimate right to share in that dream. Things had to change" [31, pp. 210–211].

Nichols was an outspoken supporter of space exploration and publicly criticized the lack of diversity in the national space program of the United States on various occasions. Around that time the US national space agency NASA opened its recruitment program to astronauts who were not pilots, but found that few women or minorities were applying. NASA officials were aware of the powerful image of the Uhura character with African Americans and women from all backgrounds, and of Nichols' efforts to use that image to promote science and technology training, and the very concept of space exploration. It also turned out that many employees of NASA were *Star Trek* fans themselves [32].

Making Friends: *Star Trek* and NASA

In a smart move, NASA hired Nichelle Nichols to run an outreach and recruitment program with the goal of increasing diversity in the growing pool of potential astronauts. The program was very successful and it was primarily Nichols who was responsible for dramatically increasing the total number of applications as well as the percentage of applications from women and minorities [33]. Various real astronauts were recruited through this program, for instance Guion Bluford (the first African American in space), Sally Ride (the first US woman in space), and Ron McNair (the second African American astronaut, and one of the seven who died in the *Challenger* disaster [32, 34]. US physician Mae Jemison, the first African-American woman to travel into space aboard the Space Shuttle *Endeavour*, said that it was not only Lt. Uhura who had inspired her as a little girl, but also the fact that the *Star Trek* crew was composed of people from all around the world, working together to learn more about the universe [35].

US media scholar Constance Penley has investigated the relationship between NASA and *Star Trek* in elaborate detail. She has found ample connections between the two. For instance, many NASA astronauts said that they were inspired by *Star Trek* and its characters. *Star Trek* fans also had engaged in petitions and other actions that eventually led to the renaming of the first Space Shuttle from *Constitution* to *Enterprise*, the name of the starship in *TOS*. Interestingly, the *USS Enterprise* in *Star Trek* is classified as a *Constitution* class starship. Another interesting story is that NASA took the ashes of *Star Trek* creator Gene Roddenberry on board of one of its spacecrafts. In public events and speeches, NASA often explicitly refers to *Star Trek* and on its official homepage NASA hails the TV series in various texts and

formats and praises its importance for those interested in real space exploration.[7] NASA also made quite an effort shooting a video in which its staff is congratulating *Star Trek* on its 50th anniversary [36]. Constance Penley therefore raises the interesting question why a "button-down" national state agency like NASA would like to associate so closely with an sf entertainment program such as *Star Trek*. She identifies a convincing reason:

"American science fiction generally shows an affinity for dystopian rather than utopian futures, often featuring fantasies of cyclical regression or totalitarian empires. Our love affair with apocalypse and Armageddon […] results from a degeneration of the utopian imagination. If *Star Trek* stands out as a rare utopian scenario of our scientific and technological future, it makes perfect sense that NASA would want to align itself with that hugely popular story of things to come" [32, p. 20].

This is especially true regarding the earlier *Star Trek* programs, when the show was indeed very utopian and technologically optimistic. However, the longer the show was running and the more spin-offs were developed, the more darker shades crept into the shows. For instance, in *Star Trek: Deep Space Nine* (*DS9*) a clandestine organization called "Section 31" appears for the first time. It claims to protect the security interests of United Earth and, later, the United Federation of Planets. This organization represented Starfleet's black-ops division that was closely connected to various crimes and intergalactic atrocities and it engaged in deeply unethical behavior.

The relationship between NASA and *Star Trek* is not a one-way street. It is not only NASA that can profit from the (generally) positive utopian scenario provided by the popular culture phenomenon. The *Star Trek* franchise also benefits from the recognition and fandom in the world of science and research and its particularly good relations with the National Aeronautics and Space Administration. For instance, various nods and tips of the hat to NASA were embedded in individual movies and TV episodes. As a prime example, a real life deep space probe from NASA's Voyager Program plays a crucial role in the plot of *Star Trek: The Motion Picture* (*ST:I*) and aforementioned NASA astronaut Mae Jemison appeared in the *Star Trek: The Next Generation* (*TNG*) episode "Second Chances" [37]. Somewhat later, astronauts Terry Virts und E. Michael Fincke had guest appearances on the series finale of *Star Trek: Enterprise* (*ENT*) [38].

Real life scientists such as the astrophysicist Stephen Hawking appeared in the *TNG* episode "Descent, Part 1". In the episode, the android Data creates a virtual reality simulation on the holodeck in which he is playing poker with Hawking and two other great historical physicists – Albert Einstein and Isaac Newton [39]. Hawking's cameo appearance in the program elevated the series also in the world of science and research, where it had had many fans already. Stephen Hawking further blessed the program by saying that fans can use *Star Trek* to think about scientific

[7] See for instance: National Aeronautics and Space Administration (NASA). (2013). NASA channels Star Trek during Voyager interstellar announcement. *YouTube*. Retrieved from https://www.youtube.com/watch?v=8eXmzFwu7n0.

ideas such as the nature of time and energy [12, pp. xi-xii]. Penley therefore concludes: "For Hawking, an engagement with popular science, here the fictional *Star Trek* universe, enables a rational understanding of the universe." [32, p. 6]. In this sense Stephen Hawing opposes the conservative view that popular culture has nothing to offer in terms of formal and informal science education and communication.

Conclusion

The popular culture phenomenon *Star Trek* has had a massive cultural and social impact on a global scale. For instance, terms like beaming, phaser, transporter, warp etc. made their way into everyday language. However, *Star Trek* also left its mark on academic work and the world of science, technology and research. For instance, a lot of research has been done in various disciplines from the natural sciences, social science and humanities on how diverse subjects and concepts are represented in the different *Star Trek* formats. Searching academic literature online databases for *Star Trek* related terms yields many results, which indicate that *Star Trek* had clear repercussions in academia and the world of science. Digging deeper, one also finds that various places, asteroids, chemical elements etc. have been named after *Star Trek* characters, actors or other aspects of the *Star Trek* franchise (e.g. the asteroid 7303 Takei and a number of roads in the United States). Various other tributes have been paid to the *Star Trek* universe inside and outside the world of science and research.

For instance, the *Star Trek* fan-operated wiki *Memory Alpha* offers a list of *Star Trek* tributes [40] that mentions among many other things the fact that the US National Air and Space Museum hosted the reception for the world premiere of *ST:I*, and other 'fun facts' like how a fan legally changed his name to James T. Kirk in 1974. Terms from *Star Trek* such as "to beam up" for using a fictional teleportation device have found entry in dictionaries and reference books. Artificial languages that were developed for the franchise, such as Klingon, are now themselves being studied by linguists [41]. It seems fair to say that individual researchers and research institutions clearly profited by engaging and referring to the rather positive utopian scenarios of *Star Trek* and by drawing on its international popularity, longevity and vitality. Engineers and inventors from all over the world have been inspired by *Star Trek*, too. Various technologies which were first introduced and presented in *Star Trek* eventually became reality. Last but not least, the characters in *Star Trek* have inspired and keep inspiring generations of women and men from diverse cultural backgrounds for various reasons. When represented in popular culture, scientists often had the reputation of being either "mad, bad and dangerous" [42] or mad geniuses. *Star Trek* was one of the first TV programs that had sympathetic portrayals of science and its practitioners. Taking all these aspects into account, it is quite certain that *Star Trek* provides and will keep on providing many more interesting examples for fruitfully studying the manifold interactions between science, technology, research and popular culture. Therefore let's physicist David Allen Batchelor from NASA Goddard Space Flight Center have the last word. As he once stated in a press release:

"I'm a physicist, and many of my colleagues watch *Star Trek*. A few of them imagine some hypothetical, perfectly accurate science fiction TV series, and discredit *Star Trek* because of some list of science errors or impossible events in particular episodes. This is unfair. They will watch Shakespeare without a complaint, and his plays wouldn't pass the same rigorous test. Accurate science is seldom exciting and spectacular enough to base a weekly adventure TV show upon. Generally, *Star Trek* is pretty intelligently written and more faithful to science than any other science fiction series ever shown on television. *Star Trek* also attracts and excites generations of viewers about advanced science and engineering, and it's almost the only show that depicts scientists and engineers positively, as role models. So let's forgive the show for an occasional misconception in the service of an epic adventure" [43].

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"Teaching with *Trek*": *Star Trek*, the LGBTQ+ Community, and College Composition

Carey Millsap-Spears

Abstract

The premise of "Teaching with *Trek*" is to illustrate the benefits of using the iconic science fiction (sf) franchise in a college composition classroom. Various science and technology topics for research and exploration can be readily found in *Star Trek*, but this chapter will have a more humanities-based focus. Its narrow focus on the *Star Trek: The Next Generation* episodes, "The Outcast", "The Host", and "Liaisons" will allow for a detailed discussion of *Star Trek*'s place in LGBTQ+ history. I discuss process composition theories and multidisciplinary writing situations in relationship to the topics found in these episodes.

These examples will be discussed thematically and rhetorically, and I will propose real examples of composition pedagogy that can be facilitated through *Star Trek* texts.

Keywords

Composition · Writing classes · Inquiry · Rhetoric · Process writing · LGBTQ+ · *Star Trek: The Next Generation* · *Star Trek: Original Series*

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Editors' Log: Chapter 09

Ask any fan what *Star Trek* is all about, what its message is, and nine times out of ten you will get a response that speaks to *Star Trek*'s optimism and celebration of diversity. More often than not, people will likely quote the Vulcan mantra of *Infinite Diversity in Infinite Combinations* (IDIC). Even so, critics have been quick to point out that, while its science fictional world holds great potential and promise, *Star Trek* does not do enough to follow through. It serves to keep in mind, however, that *Star Trek* tried to do more than many other science fiction stories. Composition instructor and humanities scholar Carey Millsap-Spears is of the same opinion. Introducing students to the workings of academia is challenging; introducing them to the vagaries of scholarly composition is arguably even harder. But, as she argues, *Star Trek* makes it easier because it comes with the basic tenets of scholarly and scientific inquiry already built-in. What's more, *Star Trek*'s inherent allegorical and didactic intentions make it an ideal vehicle for enticing students to discuss, write and generally want to know more about otherwise challenging topics such as LGBTQ+ issues. (**Eds.**)

***Star Trek: The Original Series*, 03×22, "The Savage Curtain" (1969)**
Surak: I am pleased to see that we have differences. May we together become greater than the sum of both of us.

(continued)

***Star Trek: Enterprise*, 02×14, "Stigma" (2003)**
T'Pol: *If the High Command was to learn that I was infected, I would most likely lose my commission.*
Archer: *For having a disease?*
T'Pol: *It's not about the disease. It's about the people who are capable of transmitting it.*
Archer: *Go on.*
T'Pol: *There are certain Vulcans, a small minority, who are born with the ability to perform a very intimate form of telepathy.*
Archer: *Intimate?*
T'pol: *A melding of minds.*
Archer: *That ship of Vulcans who were experimenting with emotions.*
T'Pol: *They are part of the telepathic minority. One of the reasons why they left Vulcan was to escape prejudice. Their behavior is considered unnatural. They're seen as a threat.*

> "*Star Trek* is more than just good televisual entertainment. *Star Trek* is narrative discourse that not only feeds our passion for what the future might bring but also forms a relationship with the past mediated… *Star Trek* is history." [1]

> "As a persuasive tool in imagining the possibilities of the future, *Star Trek* has the power and pull to immerse the individual completely through stories and characters that give meaning and purpose to our collective sense of identity and existence." [2]

For the past 50 years, *Star Trek* has been part of not only popular culture, but also political and historic events. To that end, it is a good choice of text for many writing situations and late-night binge-watching marathons alike. *Star Trek* helps students understand and write about complex human conditions. *Star Trek* tackles civil rights, women's rights, diversity in the workplace, and even openly discusses issues surrounding LGBTQ+ characters. While none of these circumstances may seem overly cutting edge to the discerning 21st century denizen, for much of the 20th century, many of these topics were deemed to be taboo and almost ended *Star Trek* in its earliest incarnation. And as a 15-year veteran of teaching writing at the U.S. two-year-college-level, facilitating class discussions on race or gender issues can be difficult. I have learned to incorporate more popular culture in class and have had some positive results overall, but *Star Trek* tends to break barriers (and occasionally warp cores), and students seem to relate positively to the franchise's treatment of social issues.

Essays on growing up, finding a career, and understanding one's place in society tend to be among the more popular (and assigned) textual choices in introductory college-level composition courses. Yet, a bolder choice, science fiction (sf), gives insight into the human condition in ways many students can immediately relate to. Many university and college students in the United States and in the United Kingdom take a basic course in academic writing with the learning goals of understanding

rhetorical reading and writing, composing in a variety of genres, learning situation and purpose, and discovering academic research [3, p. xvi].

Be it a classic reader or novel, finding the *text*, the right text, provides challenges for a 21st century college composition instructor. Emily Isaacs argues that close reading of imaginative material helps student writers find their voices and hone their rhetorical skills. "In all general-education writing courses—those that include intellectual prose or imaginative fiction—students can be asked to engage in ideological and cultural analyses, in short, reading and writing about texts *as* texts that are embedded in the rich context of writers' and readers' cultural, political, and historical experiences" [4, p. 110]. The cultural context, the audience, the message, and the purpose of *Star Trek* can be used in myriad ways in the college composition classroom. "Theorists in critical pedagogy emphasize the importance of student educational practices that forge connections between institutional knowledge—school discourse—and lived experiences", writes Julie Prebel [5, p. 531]. And popular culture in general and *Star Trek* specifically offers a variety of diversity not only of texts, but also of Prebel's "institutional knowledge" and "lived experiences".

Facilitating class discussions on potentially challenging issues including gender, non-binary conformity, transgenderism, and other LGBTQ+ topics can be problematic in some ways because first-year composition students are new to university-level thinking and have varied life experiences. In the U.S., the traditional-right-out-of high-school-age students have lived through the repeal of "Don't Ask/Don't Tell", the passage of marriage equality, recent media coverage of Caitlyn Jenner and gendered bathroom laws, and out LGBTQ+ characters and actors on film and television. Even so, discussing and writing about these topics can make them uncomfortable. Being LGBTQ+ is life experience, to use Prebel's terms, to at least one in ten students in each classroom according to Jennifer Robertson's reporting of Gallup's statistics [6]. Consequently, it is important for me to include writing topics relating to sexuality in addition to other diversity explorations like race and socioeconomic class. To help students gain more awareness, vocabulary, and empathy, I use *Star Trek* examples in the form of video clips and animated GIF files. Although there have been a few more instances of LGBTQ+ characters in the *Star Trek* universe, the *Star Trek: The Next Generation* (*TNG*) episodes "The Outcast", "The Host", and "Liaisons" all allow for immediate teachable situations in the college composition classroom including pre-writing, research questions, and personal-response narratives.

The first time I used a *Star Trek* example in class was during a meeting of my women's literature course. It was early in my teaching career, yet I remember it clearly. The short story we were discussing, Octavia Butler's "Bloodchild" (1984) can be read (among other interpretations) as a forbidden discussion of interracial marriage/coupling through a sf lens. I, as a life-long Trekkie, said something about *Star Trek: The Original Series*' (*TOS*) famous smooch in "Plato's Stepchildren" [7] as being the first interracial kiss on American television. I kept on explaining the narrative and nuance of the episode, and the students' eyes kept growing wider. I told them about the similar settings between the texts—the unearthly confines allowing for a discussion that would make terrans feel uneasy given the historical

cultural moment the texts emerged from. Finally, one young woman asked me why that kiss was even a "big deal". The teachable moment happened so fast that I almost missed it. They knew of *Star Trek*, but did not understand the cultural significance because of their age and life experiences. I queued up the YouTube clip of Lieutenant Uhura (Nichelle Nichols) and Captain Kirk (William Shatner) clasped tightly together in their skimpy Greek-like costumes and glittering make-up and told them the story of Uhura—how Nichelle Nichols wanted to leave *TOS*. How Martin Luther King, Jr. talked her out of it. How the kiss made TV screens all over the American South go blank—and how *TOS* was nearly cancelled over it. The short story's description and discussion of the social issue was far away, but Uhura and Kirk were right there with us projected onto the pull-down screen. I understood then the power of popular culture and how it can help students understand the assigned reading and other class materials in new ways. After that experience, I started using more popular culture texts in my composition classrooms as well.

In many American first-year composition classes, faculty members ask students to write personal narratives about special times in their lives from memory or to relate a personal belief to a reading in the textbook. These types of assignments can be challenging to present via a process approach because they are inherently personal, and some students find it hard to brainstorm or participate in peer exchange when the topics are too close to home. One way I learned to counter that potential fear is the same way *Star Trek* presents social issues. The issues are still there, but the setting changes and gives the students the space to maneuver without feeling like they may say or write the "wrong" thing. During a pre-writing exercise on "The Story of X" (1972) by Lois Gould, a piece on gender found in the class' reader, I used a clip of the *TNG* episode "Liaisons" where Commander Riker (Jonathan Frakes) tells Lieutenant Worf (Michael Dorn) that he "looks good in a dress" as they banter about Starfleet protocol and "dress" uniforms [8]. The comedic element happens as these two alpha-type males primp in front of a mirror readying themselves for diplomatic duty. Gould's "Story of X" lightheartedly addresses the issues with gender-based toys and gender-specific clothes for newborns, so the short video clip worked as a way into the conversation the textbook presented on gender as a social construct. The students responded, and a class brainstorming exercise on how they personally felt about gender-specific clothing grew organically and effortlessly. The students were able to laugh at the *Star Trek* characters bantering about their clothing, and then think deeper on the topic of how men, women, and those who do not conform to gender binaries should or do dress and what that meant to them personally.

Erika Lindemann explains that using many types of expression in class helps students start thinking more deeply on complex issues.

> "For many students, arts and media which don't involve writing offer a comfortable place to begin probing a subject. Pantomime and role-playing encourages students to act out the subject before they translate it into written form. … Persuasive papers can begin with impromptu debates, which might then be worked into brief written dialogues and from there intro more formal kinds of discourse" [9, p. 76].

While we do not act out *Star Trek* scenes in class or do holodeck-like pantomime activities, seeing the clip of an episode works much the same way. Thinking deeply about topics is the first step to writing well. Lindemann adds, "Before writers can respond to a particular task, they must define a rhetorical problem. Defining the problem requires, at the least, assessing the writer's relationship to the subject and the reader" [9, p. 192].

In addition to a discussion of the class' assigned reading, the narrative of the *TNG* episode "Liaisons" [8] itself also offers another moment for conversation, reflection, and writing. Captain Picard (Patrick Stewart), after a shuttlecraft crash, must escape from a lonely woman's clutches and rescue his injured pilot. In the end, though, both the woman holding Picard hostage and the injured male pilot are one and the same. The image of Picard kissing the woman who turns into the male pilot all in the same frame brings another level of discussion on gender and LGBTQ+ issues. Students can work in small groups, brainstorm other popular culture images like the one *TNG* presents, and create a plan that suits the assignment at hand all through viewing a short segment of the episode, guidance from faculty, and application of assigned reading. These sorts of activities and assignments, argues Isaacs, provide the moment where "[…] students can develop their abilities to marshal evidence in support of general claims, to analyze intellectually challenging ideas, and to write unified and cogent […] compositions through the pedagogies of process-writing instruction […]" [4, p. 100].

Gender and sexuality are two challenging ideas for students says James Smalls. He contends that his course "Roaming the *Star Trek* Universe: Race, Gender, and Alien Sexualities" has been successful, in part, because it provides students with a space to discuss "[…] critical issues of race, gender and alternate forms of sexuality. […] The science fiction genre, as part of popular culture, provides a seductive means of examining the intersections of the concerns of race, gender and sexuality in exciting and daring new ways […]" [2].

Apart from occasional potential "preachy" discussions on larger social issues, as some critics claim, *Star Trek* also focuses on problem solving. In a writing classroom, this is a needed skill throughout the course, but it is of special value when it comes to research writing. Learning how to write research questions is another area where students can benefit from *Star Trek*'s example. John C. Putnam illustrates a process of inquiry based on *Star Trek* and post-World War II American history. His method can be applied to many humanities-based courses. "By placing these issues and events in a different time and space, *Star Trek* can help students overcome stereotypes or personal biases", Putnam explains [10, p. 519]. And moving past bias and generalizations is an important element in research-based writing. Putnam discusses his writing assignments, and to complete any of them, students must understand the concept of research questions.

Writing research questions is a skill needed for all college students, as Alexandra Tilsey highlights. In her article, Tilsey interviews Nancy Hill of the University of Texas at El Paso about her course, "Thinking Boldly with *Star Trek*". According to Tilsey, Hill "uses the interstellar sci-fi series as a device to get first-year students thinking and talking about a number of social issues" [11]. Hill says, "It addresses all kinds of issues, from science to philosophy to social issues, so you can use it for

almost anything" [12]. Yet brainstorming a *Star Trek* topic into a research question can be a tricky task for many introductory writing students because many of them may come from educational backgrounds where a topic is chosen by a teacher and then students find the facts on the topic, and prepare the proper citations. This linear format rarely works for most research projects because as one starts looking at a large concept, the smaller ones—the details—emerge and bring the initial large concept into question. That is why I suggest and use the process of research questions and proposals before research-based writing begins.

Students should prepare three to five questions about their topics before proceeding to the "searching" phase. They do what I like to call "presearch" via Wikipedia and other online sources to gain some vocabulary and background for the questions before heading to the academic databases for primary and secondary source material. This questioning step is the hardest for some first-year students because many need to learn the lesson that answers vary based on who asks the questions. This ambiguity requires sophisticated thinking skills on complex topics. Lindemann argues for writing-as-thinking-type exercises. "A writing class offers excellent opportunities to reinforce our students' cognitive development. In our haste to teach a subject matter, we sometimes forget that we're teaching, first and foremost, a complex human being" [9, p. 69].

Various science and technology topics for research and exploration definitely exist within the *Star Trek* franchise, but the series offers stellar examples for many humanities courses as well. Example research questions from a group brainstorm:

Large question	Narrowed-down question
How do military families survive long deployments?	Is the family-life depicted in *TNG* like living on a military base?
What do the statistics on rape and sexual assault in the US armed services say about women in combat?	Are LGBTQ+ service personnel at a higher risk for sexual assault, as explored in the *TNG* episode "Violations"?
What has changed since the repeal of "Don't Ask/Don't Tell"?	How does the out couple in *DIS* change the conversation about sexuality and military service?
How has *Star Trek* helped social issues?	Why is it important that a series have a female commander, as in *VOY*?
What is *Star Trek*'s history with LGBTQ+ characters and actors?	Why did George Takei resist an out Sulu?

Undoubtedly, it takes time to learn to think this way, but *Star Trek* illustrates this type of intellectual method often. Patience with the process of research is the key to success. In the *TNG* episode "The Host" [13], Dr. Crusher (Gates McFadden) must figure out how to help a symbiotic life form survive a terrible injury. She does background reading, asks questions, and tests her theory. This is, of course, what researchers do. I illustrate these kinds of *Star Trek* examples and help students understand that it is appropriate to say, "I don't know but will find out". An admission like this itself is a form of learning. Prebel writes:

> Most educational theorists see critical pedagogy as enacting a process that is potentially empowering, particularly for students who might be disenfranchised or marginalized from

> institutionalized systems of authority, as the classroom becomes a space of possibility where students and teachers can resist ideological or structural practices and expectations [5, p. 531].

Finding subjects to research from a text is a task most humanities courses do quite regularly, and close reading and deep thinking on a text requires dedication on the part of the student. So to help find texts that resonate with students, I ask them to choose something that they personally like and explain why. It is interesting, however, how many of them choose the last book they were assigned in secondary school, and when pressed on why they made the choice, they often respond with shrugs or "I don't know" sort of moments. To help them find a text that they can relate to, I consciously use popular culture. Recently, as I was preparing to present on *Star Trek* at a popular culture conference, I decided to share my research with my classes to serve as an example of the assigned research proposal, and the results surprised me.

My proposal dealt with the *TNG* episode "The Outcast" [14] where Commander Riker falls in love with a member of a so-called genderless society, the J'naii. Soren appears more "female" rather than androgynous, and therein lies the conflict of the episode. Riker and Soren share a forbidden romance, and Soren is found guilty of the crime of gender and sentenced to therapy to cure her of this problem. After viewing a series of animated GIF files from the episode and a brief discussion of the plot, I asked the students to start brainstorming some research ideas. Some thought about the genre of sf or the history of *Star Trek*. As we started to talk it through, however, I suggested a LGBTQ+ topic. I suggested the research question "Is 'The Outcast' an accurate portrayal of restorative therapy?" They were curious and remarked that they had learned a little about that in psychology class. Once we had a question in mind, we could then decide on a path for research. We would need to understand the episode itself. We would need to know the *TNG* audience a little bit, and learn about gay conversion or restorative therapies. This exchange took about 50 min of class time, but I think it was a worthy exercise.

The students began to see how researchers in the humanities work and why this kind of inquiry has value. Audience analysis is an important component to composition and rhetoric, so I illustrated to my class that as a faculty member in the rhetoric/composition discipline, my focus could be different than a psychologist's however. After our group discussion, I shared the actual proposal I submitted and pulled my bundle of research from my messenger bag. Flickers of imagination and excitement began to appear in many of my students. They were interested in what they had to say about a topic. They were intrigued with the possibilities that popular culture and sf offered them. They saw research differently.

My proposal built on historian Putnam's suggestion about psychotherapy to treat LGBTQ+ people as a main point of "The Outcast". Putnam explains, "Like the historical treatment of gays, J'naii leaders believe that Soren needs correcting […]. This rich episode encourages students to examine societal beliefs and their own prejudices by momentarily stepping outside their own cultural environment" [10, p. 517]. But my proposal focused on the fact that Jonathan Frakes, Commander

Riker himself, lobbied for a male actor in the role of Soren. According to Memory Alpha's—a fan-operated Wiki—entry on "The Outcast" [15], he was overruled because the *TNG* producers felt that audiences were not ready to see the dashing Riker kissing a man. That semester, I read papers on everything from *Capitan America: The Winter Soldier* (2014) and unauthorized tech surveillance to a discussion of Chicago as the new Gotham city in search of a Batman. *Star Trek* opened up a world of inquiry for me and for my students.

Lindemann suggests using "personal or self-expressive writing" to help with organizational patterns. "This kind of writing confronts students with many possibilities for shaping their work" [9, p. 158]. Students could investigate the idea that being LGBTQ+ is more normalized now or how they have experienced discrimination and/or acceptance based on personal experiences or that this character, as some have argued, is merely a token. A few clips from the episode with a pre-writing session, could produce many interesting personal responses based on student experiences with life, media, and belief systems. "Thus, it cannot be ignored that *Star Trek* is a product of contemporary pop culture and is meant to reflect contemporary social issues" [16, p. 699]. Asking questions helps students to start thinking about the world around us in different ways. "It starts with questions", says Janice M. Lauer, "not answers". Students who are used to being rewarded for right answers need help to awaken their questioning minds" [17, p. 56]. So using low-risk questions about a popular film or television series gives students the confidence to ask even deeper questions on more complex topics.

Although *Star Trek* has been criticized for symbolic effort and for not going far enough with the *TNG* characters, using *Star Trek* examples in writing classes offers students many ways to discuss complex ideas and course materials, and LGBTQ+ students deserve to see representations of themselves and their history. Gene Roddenberry's unfulfilled vision for *TNG* included the normalization of LGBTQ+ characters: "In the fifth season [of *TNG*] viewers will see more of shipboard life [including] gay crewmembers in day-to-day circumstances" [18, p. 701]. Roddenberry, sadly, did not live to usher in that version of *Trek*, but *Star Trek* has changed. The newest *Trek* series *Discovery (DIS)* was hyped to not only have a female lead but also to feature a significant LGBTQ+ character [19]. And the first season of the series actually breaks even more barriers. The episode *"Into the Forest I Go,"* features the first openly gay couple on *Star Trek* actually kissing on screen. This is a watershed moment for the franchise and its fans [20].

When George Takei once asked Gene Roddenberry why there were no LGBTQ+ characters on the OS, Roddenberry told him that "If I dealt with that issue I wouldn't be able to deal with any issue because I would be canceled" [21]. To which Takei replied, "And I understood that because I was still closeted at that time. […] [B]ut I think we're getting closer to that utopian society that Gene Roddenberry visualized, much more rapidly than even the technology" [22]. "Perhaps in the future, our ability to love won't be so limited" [13], Dr. Beverly Crusher says as she breaks up with the female version of her former male lover Odian in the *TNG* episode "The Host". This heartbreaking exchange aired in 1990.

The fiftieth anniversary of *TOS* occurred in 2016, and like many of my fellow Trekkies, I find the franchise still filled with possibilities—an endless array of examples of diverse humans and aliens working together for the common good on "a wagon train to the stars." And introducing that journey to new students each semester brings me much joy as a teacher. *Star Trek* continually remains relevant and culturally significant, so using *Star Trek* in a college composition classroom can help frame discussions of gender and LGBTQ+ issues in ways students can understand and relate to. The TNG episodes, "The Outcast", "The Host", and "Liaisons" provide memorable teachable moments for writing assignments and in-class discussions: "Let's make sure that history never forgets the name *Enterprise*" [23], says Captain Picard. I agree. Engage.

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"Resistance is Futile": Using the Borg to Teach Collective Computing Systems

Lukas Esterle

Abstract

The Borg are a conglomeration of a large number of different species. They exploit the positive traits of the individual species in order to progress towards their common goal of achieving 'perfection'. When teaching about self-aware collective computing systems, the Borg are an ideal example. First, the collective system is often built from heterogeneous devices with different capabilities just like the different races in the Borg collective have different traits. Second, individual entities can enter and leave the collective without destroying its general integrity. Third, the collective operates to achieve a common goal without central coordination, even if this may not be the goal of each individual. Fourth, a self-aware system needs to adapt to each new environment on (i) the individual and (ii) the collective level. However, in contrast to Borg, our computational collectives are usually cooperative rather than trying to forcefully assimilate any species with interesting traits.

Keywords

Self-aware systems · Collective learning · Collective knowledge · Self-organizing systems

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Editors' Log: Chapter 10

When the Borg were introduced in *Star Trek*, they established a new kind of enemy for the Federation. Conflicts with the Borg revealed several interesting factors that differentiate them from species that had previously been introduced. Basically, the Borg are a vast collective of individual creatures who have been absorbed into a self-aware, networked system that operates without the need for central coordination. Lukas Esterle is a specialist in Evolutionary Computing and Intelligent Collectives. In this chapter, he dissects the Borg hive mind, and explains the differences between what goes on there, and what goes on in the real-world systems that use the same principles in the service of mankind. (**Eds.**)

***Star Trek: The Next Generation*, 02×16, "Q Who" (1989)**
***Picard**: You're familiar with this life form?*
***Guinan:** Yes. My people encountered them a century ago. They destroyed our cities. They scattered my people throughout the galaxy. They're called the Borg. Protect yourself, Captain, or they'll destroy you.*

***Star Trek: The Next Generation*, 07×01, "Descent part 2" (1993)**
***Hugh**: Perhaps my encounter with the Enterprise affected me more than I realized.*
***Picard**: What will you do now?*

(continued)

***Hugh**: I don't know. We can't go back to the Borg Collective, and we no longer have a leader here.*
***Picard**: I'm not sure that's true.*
***Hugh**: Perhaps in time, we will learn to function as individuals and work together as a group.*

***Star Trek: Voyager*, 04×02, "The Gift" (1997)**
***Seven:** You are an individual. You are small. You cannot understand what it is to be Borg.*
***Janeway:** No, but I can imagine. You were part of a vast consciousness, billions of minds working together. A harmony of purpose and thought. No indecision, no doubts. The security and strength of a unified will. And you've lost that.*
***Seven:** This drone is small now. Alone. One voice, one mind. The silence is unacceptable. We need the others!*
***Janeway:** I can't give you back to the Borg, but you're not alone. You're part of a human community now. A human collective. We may be individuals but we live and work together. You can have some of the unity you require right here on Voyager.*

Introducing the Borg

The cybernetic alien race Borg was first introduced in the second season episode "Q Who?" of *Star Trek: The Next Generation* (*TNG*) [1]. The original idea behind the Borg was to develop an insectoid race which would act as one large entity, similar to some insects such as bees or ants in Earth's ecosphere who have something like a collective mind. During production, however, they evolved into a cybernetic race, where self-aware machines infest and take over their biologic hosts. Only the idea of collective behavior and a collective consciousness remained from the original concept [2]. Here, each entity, called a *drone* following the naming convention of bees, is acting autonomously but is following a greater, common goal of the entire collective. The Borg are represented by a designated queen who brings "order to the chaos" [3]. However, this queen does not control or lead the collective *per se*.

In *Star Trek*, the Borg try to assimilate any other race that they assume to be beneficial to achieving their own goal of 'perfection'. Races presumably not contributing in any way towards this goal, are often simply ignored by the Borg. A single race, Species 8472 in *Star Trek: Voyager* (*VOY*) [4], and the Undine or Fluidians in the computer game *Star Trek: Online*, were able to withstand the assimilation of the Borg due to their biological resiliance. In the assimilation process the Borg use microscopic machines called nanoprobes to introduce other races into their collective. Nanoprobes initially rewrite cellular DNA before altering the biochemistry of the individual to be assimilated. As soon as the nanoprobes have taken control over their victim, they will perform more complicated actions and interact

with each other within the body, using existing structures such as bloodstreams or the nervous system. The assimilation process is usually completed when the nanoprobes have created cybernetic devices in symbiosis with their new host, often visible as prosthetic devices to the outside world.

While the Borg are one of the main antagonists in the *Star Trek* universe, they have various interesting traits that can be used in different non-harmful systems in computer science. The Borg can be used as an example to teach students about collectives, self-aware systems, multi-agent systems, collective behavior and learning, and robustness and flexibility.

The Borg, Their Traits, and Computer Science

Even though the Borg are the main antagonists in various *Star Trek* episodes and films, in computer science we do not consider their harmful behavior as a foundation for new research. On the contrary, we try to extract interesting ideas put forth by *Star Trek* and apply them to systems designed to support the human race rather than assimilating it into a cyber-genetic species. These ideas are diverse and range from the individual self-aware entity and its autonomous behavior to the collective as a whole, and its capability to learn and behave as a collective.

Self-Aware Systems

Each individual drone within the Borg collective can operate autonomously and in a self-aware manner. Self-awareness is the ability of introspection and it is necessary in order to distinguish oneself as an individual from the environment and from other individuals. This means that every single Borg drone is able to assess its own capabilities, state, and the state and capabilities of others. It possesses the ability to identify changes in these states as well as the impact of actions on the environment. Furthermore, it is able to distinguish its own actions from actions performed by other individuals. Usually, this ability is mostly attributed to humans, but has also been shown in animals such as primates, dolphins, magpies, or elephants. In the Borg, one might argue that the ability of self-awareness is based on the self-awareness of each respective assimilated species. However, the Borg themselves are considered a race of living machines, which infests and takes over the body and mind of its host. This allows us to attribute this self-aware capability to the underlying computational/mechanical part of the Borg race.

This idea is reused when teaching about self-aware computing systems. Here the computational system has to create a model about its own capabilities, learn about its own actions, and build an internal representation of its environment. This needs to be achieved regardless of the physical representation and capabilities of the system. In addition, the computational system needs to make a clear distinction between itself and the environment. This includes its own appearance as well as its own actions. It has to be clear to the system if occurrences, events, and conditions

present in the environment were introduced by the respective system—through its actions or simply through its presence, whether they came from some other entity, or if they are just due to a natural phenomenon. This becomes more complicated as every single entity differs greatly from every other. The individual has to learn on its own and, without respective approaches, each new entity has to start over again from the beginning.

While this behavior seems natural for us humans, it is supported by both physiological similarity and our common social environment, with our parents being our mentors and teachers at an early age. To achieve self-aware behavior is not a trivial task for a computing system. As humans, we start to learn this ability right from the beginning and continue every waking hour, while being supported by mentors such as our parents. Nevertheless, we develop it only after we are approximately two years old. We might, mistakenly, expect a computer to achieve such capabilities much faster. In this case we underestimate the computational power and processing capabilities of the human brain. Nevertheless, we will discuss collective learning, as used by the Borg, as means of acquiring knowledge faster and more precisely, enabling self-aware capabilities much faster.

While the Borg are a perfect example of self-aware machines, it is certainly not the only example of a self-aware system that has been developed in science fiction (sf). Other famous examples include, but are not limited to, the on-board-computer HAL 9000 from Arthur C. Clarke's *Space Odyssey* [5], QT1 in Isaac Asimov's *I, Robot* [6], or Skynet from the *Terminator* Series [7].

Collectives

One of the most interesting features of the Borg is their ability to operate as a collective of heterogeneous entities. When teaching about sensor and actuator networks, we often talk about heterogeneous devices, i.e. devices which do not all have the same capabilities. Some of them may be able to measure temperature and humidity, while others can open windows or doors. However, in most cases, these networks are controlled from a central coordination unit. This is often a server that collects and accumulates all the information from the network for further analysis; not so with the Borg. While they have a Borg queen, who is supposed to bring order to the chaos, her role is somewhat disputed and not entirely clear. However, the Borg are designed as a collective where the Borg queen is not a central coordinator that gathers all information from the individual drones. Here, the individual drones operate autonomously and do not rely on any control inputs from their queen.

To understand the concept of the collective, one also needs to understand the underlying concept of the Borg queen. A collective is the conglomeration of entities. In the case of the Borg these comprise different species. Each entity is operating autonomously but following the greater goal of the collective. This greater goal is usually shared among all entities of the collective. However, each individual may still have its own goals, which while specific, usually do not contradict the goals of the collective. The Borg queen is not as much a central controller that is governing

the collective, as it is a means to represent the Borg race. The queen is the unifying voice speaking for and allowing others to interact with the collective. While in the *Star Trek* universe, the Borg queen is sometimes shown to actively control various numbers of drones, this is only to defend itself and ensure the continued existence of a unifying voice for the Borg race rather than to override the behavior of the collective.

Benefits of the Borg and Collectives

The collective itself, being a decentralized, heterogeneous race, has multiple interesting features and abilities which are also used in distributed sensor and actuator networks:

- *Distributed, collective knowledge:* In the *Star Trek* universe this is referred to as the hive mind. Knowledge is not stored at a single place, but distributed among the entire collective. As long as a drone is connected to the collective, it is able to access the entire knowledge of it. If a drone is not connected, it may still gather new information for the collective. This new information is then integrated into the hive mind as soon as the drone reconnects. Inferring and reasoning about this information allows the collective to generate new knowledge. This represents a great benefit to the race, as knowledge cannot be lost as it has been integrated within the hive mind and can be used by anyone within the collective. Furthermore, from a computational point of view, it represents a perfect way of accessing information. As information is not stored at different specific locations, all information can be accessed equally and the effort accessing it is not affected by the distance to the location where this information is stored. There are similarities to shared cloud storage where multiple persons access the same information. The information can be distributed among multiple servers in the cloud. Yet, for accessing it, one does not need to know its actual, physical location. Neither is accessing the information affected by the distance to the individual server. However, in comparison to the collective, knowledge is not generated nor used by the cloud itself but rather by the individual users.
- *Collective learning:* Since information is not only stored locally, every individual can contribute to extending this common knowledge base. In collective learning, knowledge is created by the individual to be used by all other entities within the collective. This also allows them to analyze the information and reason about it concurrently, expanding their knowledge even faster. Instead of having a single entity perceiving its environment and analyzing the gathered information, each entity in the collective can gather its own experiences, learn about them, and feed the generated knowledge back to be available for everyone in the collective.
- *Self-adaptation and self-organization:* Self-adaptation happens on two different levels; at the individual level, and on the level of the entire collective. If the individual cannot achieve a goal, whether it is an individual or collective goal, it will try to adapt in order to progress towards this goal. If the individual's self-adaption

does not suffice, the collective will start to adapt accordingly. Since self-organization is guided by rules of the collective, self-adaptation on the collective level requires the adaptation of these rules in order to change the employed strategies on how to approach each goal.

- *Exploiting heterogeneous abilities and behavior:* In sensor and actuator networks, each individual node is often able to perform the same tasks. This simplifies the development as well as the deployment of the networks. However, having nodes with different capabilities can be highly beneficial. Here, the specialized nodes might be able to act differently in a specific environment or situation. This allows the collective to achieve given goals more efficiently as some individuals can accomplish them even though others might not. This benefit can be reached with physical heterogeneity [8] as well as with behavioral heterogeneity [9]. It has been shown that adapting dynamically towards heterogeneous behavior in collectives outperforms any static behavior defined *a priori* [10]. The Borg achieve this heterogeneity through two different means. First, through assimilating different races. While the benefits of the assimilated species are integrated into the collective, the individual still retain their physical benefits over other individuals of other races. Second, the Borg improve the physical capabilities of the individual through cybernetics and prosthetic implants. These implants are not the same for each individual creating a *natural* heterogeneity.
- *Robustness and flexibility:* In collective systems such as the Borg, removing a single entity does not cripple the entire collective. Even when a larger number of individuals is removed at once from the collective, this may affect the performance only in terms of achieving a given goal. However, it may not prevent the collective from achieving its goals in general. This has happened multiple times in the *Star Trek* universe, when drones left the collective and operated individually, or when individual drones were destroyed or killed. In a similar way, new entities added to the system may not disrupt its general integrity. This means new individuals can join the collective without having a negative impact on the performance of the collective.
- Both features are highly sought after in computational collective systems. Removing an individual drone may cripple the collective as redundant drones are expensive. At the same time, adding new drones can increase the computational complexities and increase the communication overhead on the entire collective.

Conclusion

In the *Star Trek* universe, the Borg are portrayed as a deadly race assimilating other species and effectively terminating their existence. Due to this behavior, the Borg do not make a good example for a lecture on ethics. However, with respect to computer science, the Borg do have some interesting behavior and capabilities we are still trying to imitate in computational collectives.

Computer scientists have achieved the discussed benefits with varying success. Self-aware systems in general are still in the early stages of development. Collective

knowledge can be achieved to some extent, with so-called *middlewares,* granting the entire collective access to all available information but abstracting the location of this information within the network from the individual. The idea is even used in applications we use every day and is known to us as cloud storage. Collective learning has been achieved through extensive information and knowledge exchange but requires a large communication overhead. Having multiple (low-performance) learners operate simultaneously often outperforms a single high-performance learner in direct comparison. The benefits of heterogeneity have been shown in different situations. Heterogeneous systems often outperform their homogeneous counterparts in the same situations when the individual capabilities fit the given situation for the corresponding entity. Being able to adapt to a given situation and to change its own behavior or abilities accordingly is even more beneficial and allows the collective to achieve even better performance. Through sophisticated protocols, robustness and flexibility can be achieved in collective systems allowing them to deal with failing subsystems and to add new systems during runtime.

Having these parallels with collective computing systems, the Borg can serve as a good example in teaching computer science students about collectives and self-aware systems. As most of the engineering students are already familiar with *Star Trek* and the cybernetic race of the Borg, they require very little explanation. For those who are not, a quick introduction is given to enable them to follow the discussed concepts using the Borg as an example. Adding short clips from the movies or the TV show helps to make the lecture less monotonous. Examples for this would be the assimilation of Captain Jean-Luc Picard (Patrick Stewart) by the Borg [11], or the death of the Borg queen in *VOY* [12] where the Borg have to cope with her loss but do not lose her knowledge.

While the fictional Borg are the main antagonists in *Star Trek*, their concepts can be applied in real-world systems that aid humanity. Assimilated knowledge can be applied in large-scale sensor networks to observe environmental change, in smart transportation systems able to operate in a highly dynamic environment without causing congestion, in search-and-rescue systems adapting at runtime to changing conditions and learning collectively about the current situation, and in future production systems able to quickly and autonomously adapt to the requirements of the customer.

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Telepathic Pathology in *Star Trek*

Victor Grech

Abstract

Psi is a term used by parapsychologists to refer to both extrasensory perception and psychokinesis, abilities that have never been proven to exist. Telepathy is a form of psi, the direct communication of thoughts from one mind to another. In *Star Trek*, various kinds of telepathy have been displayed, often as unique alien properties. *Star Trek* has not only explored the possibility of the existence of telepathy, but also its logical corollary, the possibility of coexistent pathology. This essay will describe these fictional conditions from a medical perspective and will demonstrate that telepathic disease is depicted as working at longer distances than conventional (even air-borne) diseases. This imaginary medium is shown to communicate neuroses or psychoses to others via direct, mind-to-mind transfer, to one individual or to multitudes in epidemic proportions, often at distances that would require the equivalent of electromagnetic radiation as a mode of transmission. Since science fiction purports to be the handmaiden of the sciences, *Star Trek* treats these disorders with their own internal and therefore plausible logic in a convincing display of legitimacy, boldly taking us where no known diseases have gone before.

Keywords

Psi · Telepathy · Communication · Pathology · Contagion

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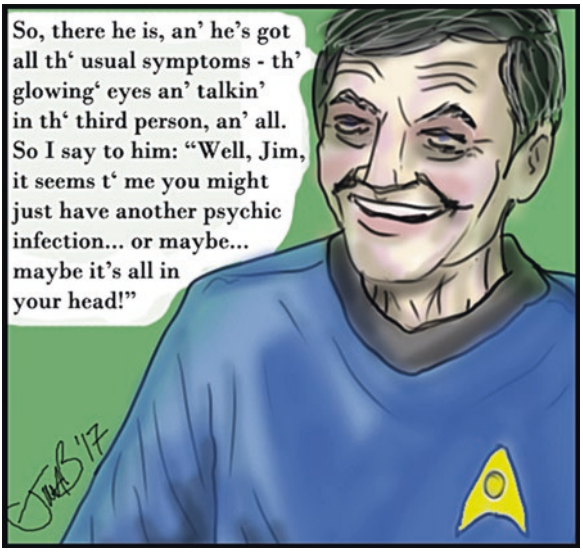

Editors' Log: Chapter 11

Three of the earliest episodes of *Star Trek* dealt with different telepathic pathologies. In each case, the "infection" or "contamination" took hold of crewmembers and changed their mental states. The concept of telepathic infection was revisited in many incarnations of *Star Trek*. Though he is not an escalator, Doctor Victor Grech uses the following chapter to raise the possibility of examining *Star Trek*'s telepathy from a medical point of view. Furthermore, and despite the fact that he is not a bricklayer, Doctor Grech uses the story-driven properties of telepathy in *Star Trek* to help his students build a foundational understanding of real-world pathology. (**Eds.**)

***Star Trek: The Original Series*, 01×03, "Where No Man Has Gone Before" (1966)**

Spock: *The tapes are pretty badly burned. Sounds like the ship had encountered some unknown force. Now, orders, counter orders, repeated urgent requests for information from the ship's computer records for anything concerning ESP in human beings.*

Kirk: *Extrasensory perception. Doctor Dehner, how are you on ESP?*

Dehner: *In tests I've taken, my ESP rated rather high.*

Kirk: *I'm asking what you know about ESP.*

Dehner: *It is a fact that some people can sense future happenings, read the backs of playing cards and so on, but the esper capacity is always quite limited.*

(continued)

***Star Trek: The Original Series*, 01×04, "Naked Time" (1966)**
Kirk: *Not even a theory, gentlemen?*
McCoy: *Definitely not drugs or intoxication. The bio-analysis on the tapes prove that conclusively.*
Spock: *It could be some form of space madness we've never heard of, but it would have to be caused by something. Our spectro-readings showed no contamination, no unusual elements present.*
Scott: *Or at least none your tricorders could register.*
Spock: *Instruments register only those things they're designed to register. Space still contains infinite unknowns.*

Introduction

Psi is a term used by parapsychologists to refer to both extrasensory perception (ESP) – perception occurring independently of sight or any of the other conventional senses. It also includes psychokinesis, i.e. the production of motion in physical objects by the exercise of psychic or mental powers, including telekinesis, the movement of objects by scientifically inexplicable means. The term "psi" was coined by biologist Berthold P. Wiesner in 1942 and popularised by Robert H. Thouless (1942) [1]. Interest in this field was heightened by Joseph B. Rhine and associates in the 1940s and 1950s. They conducted various experiments that initially appeared promising but lacked reproducibility [2]. Indeed, experimental research on parapsychology has been ongoing for over a century with no concrete results. The only certainty in this field of research is that as repeatedly shown, the subjective observation of paranormal phenomena is related to the degree of belief in such phenomena [3].

A form of psi, telepathy is defined as the direct communication of thoughts from one mind to another without the utilisation of conventional ordinary vocal and auditory mechanisms. While the existence of telepathy has never been scientifically proven, its existence cannot be discounted since it has not been formally proved that telepathy qua telepathy is impossible. In *Star Trek*, telepathy of various kinds has been displayed, usually in alien species. This is often portrayed as an integral part of what makes such aliens unique and thereby somehow different from humanity. In the *Star Trek* universe, telepathy may be used remotely, for communication at a distance [4], or may be limited through the use of direct physical skin to skin contact [5]. Some telepaths are limited to communication solely with their own species while others can communicate with non-telepaths [4].

Mental disorders (neuroses or psychoses) are not uncommon in the human population. *Star Trek* has explored not only explored the possibility of the existence of psi in the form of thought transference, but also its logical corollary, the existence of pathology associated with telepathy.

Darko Suvin defined the science fiction genre as "the literature of cognitive estrangement" (372), a literature that "takes off from a fictional ("literary") hypothesis and develops it with extrapolating and totalizing ("scientific") rigor". Moreover, while all fiction is at one remove from reality, SF is doubly removed through the additional introduction of "a strange newness, a novum" [6, p. 372–374], an estrangement similar to the *ostranenie* noted by the Formalist school. Thus, SF "is, then a literary genre whose necessary and sufficient conditions are the presence and interaction of estrangement and cognition, and whose main formal device is an imaginative framework alternative to the author's empirical environment" [6, p. 375].

This essay will describe these fictional telepathic conditions from a medical perspective, including purported methods of disease transmission. It will be shown that mental disease is married to a transmission modality that has properties that resemble electromagnetic radiation. In this way, disorders of the mind are transmitted to others at distances greater than those of known airborne contagious diseases. It will also be shown that the takeover of minds is akin to psychosis, with special emphasis on schizophrenic paranoid delusions.

Mass Effects

Disease in the real world may spread rapidly and widely via airborne epidemics, such as seasonal influenza, or via water supplies, such as cholera. In typhoid, another water-borne condition, a single carrier (such as the infamous Typhoid Mary) may infect multitudes.

Telepathic races may potentially affect more than a single individual due to a wide broadcast effect. This is shown to happen pathologically in Vulcans and Betazoids, two humanoid alien races in *Star Trek*, with ill-effects on bystanders, as a form of epidemic.

An ageing telepathic Vulcan ambassador is shown to be afflicted with "Bendii Syndrome. Its early symptoms include sudden bursts of emotion, mostly irrational anger. Eventually, all emotional control is lost. [He] may unintentionally be projecting intense emotions onto other people, at random". And indeed, the crew witness episodes of "random violence all over the ship" [7]. This could have led to the failure of a crucial mission, the signing of a peace treaty between warring races. Captain Picard (Patrick Stewart) therefore offers to temporarily stabilise the Vulcan by being "linked telepathically, sharing our thoughts, becoming in essence one mind. […] Which, for a few hours, should provide the emotional control you need. In that time, you can meet with the Legarans and conclude the treaty." The ambassador's mental faculties are steadied: "I am myself again. It has been a long time." But the intense emotions that are drained from the Vulcan overwhelm Picard who raves and rages. In a lucid moment, Picard sobs "it's quite difficult. The anguish of the man, the despair pouring out of him, all those feelings, the regrets. I can't stop them. I can't stop them. I can't. I can't."

Yet another ageing alien, this time female, also telepathically affects others when she falls ill with an exotic alien disease. "Zanthi fever […]. That only effects older

Betazoids […] a virus which effects the empathic abilities of mature Betazoids. It causes them to project their own emotions onto others". It affected "only those within close proximity to her when she had an attack" [8]. In the episode, since the woman is menopausal and libidinous, the effects transmitted are those of amorousness and outright lust.

In both situations, the effects of this abnormal broadcast are terminated once the condition is diagnosed and the source is identified, treated and thereby neutralised. In the Vulcan's case, no actual cure is available since this is a chronic and degenerative brain condition. But with "Zanthi fever," "a simple wide spectrum antiviral agent" suffices to cure the afflicted individual and source for this particular epidemic. This would be tantamount to treating a chronic disease carrier in a real-life situation.

Artificial memories of events may also be implanted en masse. An entire starship crew is affected by a planet-bound "synaptic transmitter. […] designed to send neurogenic pulses throughout this system. […] So anyone passing through would experience the Nakan massacre, […] a memorial. […] we were witnesses to a massacre. […] By being forced to relive those events, half the crew's been traumatised. […] They wanted others to know what it was like in the hopes that nothing like it would happen again" [9]. The telepathically implanted artificial memories therefore serve as a virtual memorial to a massacre of alien humanoids.

Some races or individual members of species are such powerful telepaths that they are able to completely immerse naïve minds in entire universes of their own fabrication [10]. These psionic powers may be passed on to others who are incapable of controlling them maturely and responsibly, and so react in a pathologically violent and inappropriate way to other members of their own species [11]. In the *Star Trek* universe, more mature members of such races develop moral standards that prevent them from influencing others through their psionic abilities.

Telepathic abilities may also be mechanically enhanced, and in belligerent hands, can be used as weapons of mass destruction. This is evinced by an ancient Vulcan "psionic resonator," in effect, a novel biological weapon [12].

Similarly, a well-meaning scientist imposes peace on an entire society through a telepathic "machine's concept of perfection. Peace, harmony. […]. The good is the harmonious continuation […]. The good is peace, tranquillity." The machine is challenged and self-destructs when it is faced with evidence that its actions are harmful to the society that it controls: "without freedom of choice, there is no creativity. Without creativity, there is no life. […]. The fault is yours" [13].

Single Effects

Some real-life diseases are less communicable than others, and are passed from person to person with some difficulty, such as leprosy. This is transmitted by a mycobacterium, as is tuberculosis. Both of these conditions also require not only close proximity but also poor conditions of hygiene for transmission.

The *Star Trek* equivalent is Pa'nar Syndrome, a Vulcan neurodegenerative disease that also affected the sufferer's endocrine and immune systems. Contagion occurred during Vulcan mind melds when performed by individuals who were improperly trained in the melding technique. Cure is effected by a meld performed by an experienced melder [14]. A starship crewperson is also forced to relive flashbacks of a massacre in dreams which are implanted telepathically, exposing the event [15]. Telepathy may be used to project a mind transiently into another, and in the properties of each individual mind are shown to be temporarily retained. For example, this is used for therapeutic effect when a Vulcan telepathically links a psychopathic serial murderer who becomes "[q]uite calm and controlled. But the procedure emotionally and violently overwhelms the Vulcan, who has to be restrained in his quarters" [16]. "We go home. Every seven years of our adult life, Vulcans experience an instinctual, irresistible urge to return to the homeworld and take a mate". Both male and female Vulcans experience "pon farr. The time of mating," "a blood fever" that manifests as an extreme physiological storm that rampages through the Vulcan body in an uncontrollable manner [17]. Unless they mate, Vulcans die [18]. However, in one instance, a Vulcan in pon farr accidentally transmits pon farr to a half-Vulcan, with resolution when the condition is identified [17]. Finally, in various episodes, telepathy is also shown to take over entire minds in a manner reminiscent of the dybbuk in Jewish mythology, whereby a malevolent soul or spirit possesses another body, a topic that has already been discussed at length [19].

Conclusions

Telepathic diseases in *Star Trek* are often displayed as contagion at a distance through a novel form of transmission. This is an unknown and undescribed (even within the genre) form of radiative process that is passed on from one person to another or to others. Air-borne contagion is well known but telepathy is depicted as transmitted at distances greater than those traditionally encountered in conventional diseases. Indeed, it is almost as if telepathic pathology is transmitted via Bluetooth, electromagnetic communication that in typical (so-called Class 3) devices has a range of up to 10 metres using a power output of 1 milliwatt. However, the longer ranges sometimes demonstrated as reached by telepathy are more akin to wifi ranges, and such wireless routers typically have a range of just over 30 metres using 100 milliwatts of power output. The longest ranges would equate to microwave transmission which can reach 100 kilometres.

While all aspects of ESP are somewhat ethereal and improbable, it is impossible to say with complete conviction that no aspect of extrasensory perception (ESP) is possible. This is because even government agencies have explored the possibility that some feature/s of ESP may usefully exist. Indeed, during the Cold War, both the Pentagon and the Central Intelligence Agency attempted ESP spying missions

around the world. These missions included mind-reading and attempting to forecast the future [20]. (Schnabel 1997).

Since science fiction purports to be the handmaiden of science, the genre generally reflects science as accurately as possible, nodding to immutable physical laws while gently sidestepping them through technobabble and other *ersatz* scientific legerdemain. This is the approach taken in *Star Trek*, such that episodes that invoke pathology arising from telepathy, a science-fictional fiction, acknowledge and bow to the laws of known science. In this way, fantastic notions accede to and succeed in the admonition that the reader and viewer suspend their willing suspension of disbelief in order to understand, appreciate and ultimately enjoy the narrative.

Basic principles of disease transmission are also adhered to, as in true medical pathology, with single individuals affected by touch. This occurs in the real world with fastidious micro-organisms requiring direct transfer across mucous membranes, such as with sexually transmitted diseases. *Star Trek* yields no such examples. More robust micro-organisms do not require such intimate contact and may be transmitted through fomites, which are defined as any object or substance capable of carrying infectious organism/s and transferring them from one individual to another. This is the process whereby diseases such as gastroenteritis and polio circulate within communities.

The wider diffusion of telepathic disease also adheres to the pathological processes of disease transmission, with contagion from one individual to many. This occurs, for example, in respiratory diseases, such as tuberculosis, influenza and even the common cold. Telepathic pathology that affects many from one person also adheres to these tenets of disease transmission in *Star Trek*. Thus, it is almost as if mental disease is married to radiation that has properties that resemble electromagnetic radiation, such that disorders of the mind may be transmitted to others at distances that are far above those of known airborne contagious diseases, and perhaps this may be possible since such pathologies would require the involvement of micro-organisms. On the other hand, the takeover of a mind is more in keeping with psychosis, specifically, schizophrenic paranoid delusions. However, in *Star Trek*, the novum portrayed is that of a mind-body dualism [19] with mind that can actually be divorced of physical body, the unneeded Gibsonian meat [21] that is discarded for better pastures.

The nuances that various normal and pathological forms of telepathy are portrayed as having, aid the attempt to simulate plausible scenarios, since these conditions appear to be somehow informed by scientific dicta. Indeed, the overall attempts of science fiction to emulate true science may be part of the genre's enduring popularity, along with the approbation that *Star Trek* continues to enjoy from its fans, with the franchise taking telepathic pathology where it has never gone before.

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Playing Captain Kirk: Designing a Video Game Based on *Star Trek*

Mathias Lux and John N. A. Brown

Abstract

Video games are currently immensely popular and are now a major part of the entertainment industry having already outperformed movies in terms of revenue. The *Star Trek* universe on the other hand is iconic, has its place in popular culture and is often associated with people playing video games. But has *Star Trek* been successful in a video game context? While other major and iconic science fiction universes have provided a narrative world for many successful games, and even science fiction worlds of video games have become part of the popular culture (e.g. *Mass Effect*, *Wing Commander*, *Elite* etc.), *Star Trek* seems to lack notable success in the video games business. This chapter examines the history of video games based on the *Star Trek* universe, and the problems that seem to make such video games unpopular. Using the principles we have outlined, and addressing the issues and pitfalls we identified, we then propose a new, original game based in the *Star Trek* universe.

Keywords

Game Design · Neuropsychology · *Star Trek* · Game Reviews · Pokemon Go · User Experience · Flow

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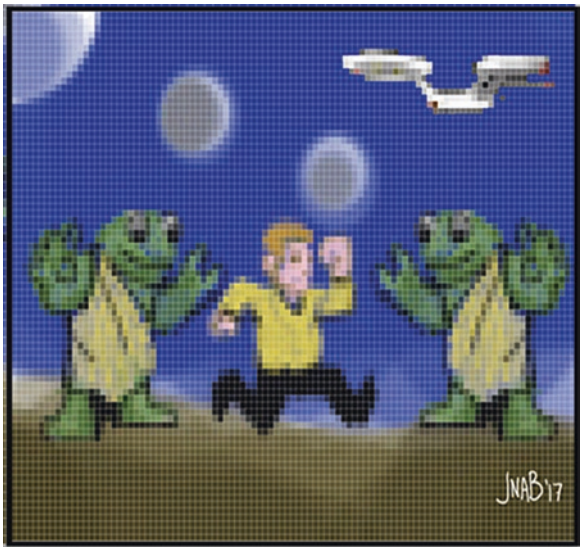

Editors' Log: Chapter 12

Star Trek is mostly known for popular TV series and movies, and these incarnations often feature games and gaming. Yet, to date, *Star Trek*-based video games have not met with great success amongst either gamers or Trekkies. Mathias Lux teaches graduate courses on gaming and hosts a popular annual game jam. He and John NA Brown discuss challenges and success stories in the context of a number of *Star Trek*-related games published since 2000 and then boldly go on to propose a new game idea that offers established in-game reward mechanisms without violating the underlying principles of *Star Trek*. **(Eds.)**

***Star Trek: The Original Series*, 01×17, "Shore Leave" (1966)**

Caretaker: *Here you have to only imagine your fondest wishes, either old ones you wish to relive or new ones, anything at all. Battle, fear, love, triumph. Anything that pleases you can be made to happen. [...]*

Caretaker: *This entire planet was constructed for our race of people to come and play.*

Sulu: *Play? As advanced as you obviously are, and you still play?*

Kirk: *Yes, play, Mister Sulu. The more complex the mind, the greater the need for the simplicity of play.*

Caretaker: *Exactly, Captain. How very perceptive of you.*

(continued)

***Star Trek: The Next Generation*, 01×12, "The Big Goodbye" (1988)**
Computer: *File or access code.*
Picard: *File Dixon Hill, private detective.*
Computer: *Enter when ready.*
Picard: *Captain's personal log. I'm entering the ship's holodeck, where images of reality can be created by our computer. Highly useful in crew training, highly enjoyable when used for games and recreation.*

Introduction

Star Trek is undeniably an iconic and global phenomenon that has found its way so deeply into popular culture that it is even used as a frequent reference within popular culture. One very prominent example of this meta-referential state is the recurring theme of *Star Trek* in *The Big Bang Theory* (*TBBT*), a popular sitcom produced by Warner Bros. Television. There, the main characters of the show frequently refer to Kirk, Spock, "Bones", "Scotty" and many ideas and technologies espoused by *Star Trek* franchise. Similar meta-referential treatment occurs in other media and in journalism about media where, like in *TBBT*, the culture of *Star Trek* fandom is often related to the culture of computer game fandom. This seems to be based on the strange premise that since nerds play computer games, and since nerds like *Star Trek*, then nerds must do both. Despite the size of the presumptive audience this would provide, so far no one has managed to develop an overwhelmingly successful video or computer game set in the *Star Trek* universe.

Why Is That?

We propose that the games developed to date have failed to see how two core underlying principles of *Star Trek* can be made to suit game play without offending the expectations of either set of fandom. At its core, *Star Trek* is a celebration of discovery and cooperation. Any game that misses this point may be exciting and challenging and rewarding enough to please gamers, but would alienate fans of *Star Trek* who are looking for an experience that lives up to their long association with the franchise. Conversely, any game that delves too deeply into the principles of cooperation and discovery, rather than immediate cycles of reward-based call and response, might please die-hard fans of the franchise, but would not please gamers whose sole motivation is entertainment.

The corollary is that the game designer who seeks to develop a popular game which would not offend a target sub-group of potential players, would do well to develop a strategy of short- and long-term reward cycles based on the excitement inherent in being on the front lines of cooperative discovery. This would create a stimulating and rewarding gameplay set within a well-established corner of the *Star Trek* franchise.

What Would It Take to Get There?

In this chapter, we will first provide a meta-evaluation of the last 16 years of *Star Trek*-based games. Then we will outline cornerstones of successful games and investigate in detail which of these cornerstones could correspond with key concepts in *Star Trek*, like an economy without money, career paths of individuals, and typical narratives. Then, we will argue what makes a good video game hero and discuss which key role in *Star Trek* is most suitable for video games, especially cooperative ones. Finally, we provide a brief proposal for a new game based on an established concept central to the *Star Trek* universe.

Star Trek & Successful Games

In the computer and video game industry, success is currently measured primarily by aggregated and averaged review scores. One of the most prominent meta review pages is *Metacritic,*[1] owned by CBS Interactive. On *Metacritic* — according to their own web site — the most respected critiques are collected, the review scores are normalized, and the aggregated score, called *metascore*, is presented in number (0–100) and colors (red to green). Of course the meta scoring system has led to debates, a recent one involving the popular video game *Uncharted 4: A Thief's End* (2016). The metascore of this game is reasonably high with 93 score points, being at the time of writing the third best video game for PS4.[2] However, there is one negative review compared to 110 positive ones. This negative review is clearly focusing on a very small aspect of the overall game and reflects a very subjective opinion instead of trying to be a broad and objective review. Despite the narrow focus, this review is included in the ranks of the most respected critiques and shows that *Metacritic* of course can give us only so much of an approximation.

Still, interpreting the metascore as an approximation of the wisdom of the crowds, it can be seen that *Star Trek* has not led to many well-known and well-received games. A selection of twenty *Star Trek* related games and their metascores (or the maximum thereof over all published platforms) can be seen in Table 1.

Typically, games with a score over or near to 90 are considered great, while games around and below 75 are considered "not well received". As it is easy to see, there not many *Star Trek* related games that have been a huge success. The most outstanding examples are:

- *Star Trek Voyager - Elite Force* (2000) - 86 Metascore. This game is a first person shooter with the subtitle "Set phasers to frag". It is built on top of the id 3 game engine sharing the game mechanics with Quake III Arena, featuring multiplayer modes for up to 32 people.

[1] See http://www.metacritic.com/.

[2] Retrieved from http://www.metacritic.com/game/playstation-4/uncharted-4-a-thiefs-end.

Table 1 List of 20 *Star Trek* related computer and video games with their maximum metascores over all published platforms

Year	Title	Max. Metascore
2000	*Star Trek: Invasion*	76
	Star Trek: Voyager – Elite Force	86
	Star Trek: Deep Space Nine: The Fallen	81
	Star Trek: ConQuest Online	63
	Star Trek: New Worlds	52
2001	*Star Trek: Starfleet Command: Orion Pirates*	78
	Star Trek: Armada II	65
	Star Trek: Deep Space Nine: Dominion Wars	64
	Star Trek: Away Team	64
2002	*Star Trek: Bridge Commander*	82
	Star Trek: Starfleet Command III	78
	Star Trek: Elite Force II	78
2004	*Star Trek: Shattered Universe*	42
2003	*Star Trek: Tactical Assault*	64
	Star Trek: Legacy	64
	Star Trek: Encounters	51
2007	*Star Trek: Conquest*	54
2009	*Star Trek D×A×C (Deathmatch. Assault. Conquest)*	62
2010	*Star Trek: Online*	66
2013	*Star Trek*	45
	Star Trek: Online: Legacy of Romulus	76

- *Star Trek: Deep Space Nine: The Fallen* (2000) - 81 Metascore. This game is a third person shooter build on top of the Unreal engine making it similar to the Unreal series. Players actually follow a storyline and play along a pre-constructed plot.
- *Star Trek: Bridge Commander* (2002) - 82 Metascore. This game is a space combat simulator, where players take over the role as captain, commanding a ship in the *Star Trek* universe.

It is easy to see in the brief descriptions of the examples above that key concepts of the *Star Trek* universe may have been lacking. "Set Phasers to Frag" is certainly a departure from the ideologies of exploration and discovery, or success through cooperation. The culture of *Star Trek* seems to be absent, from the money-free economy to the concept of collaborative decision-making, to say nothing of the rules for contact and interference with other species. The Prime Directive in *Star Trek*'s philosophy is non-interference. Therefore, battle-based games are hard to justify in the *Star Trek* universe, as conflicts always are related to direct interference. In contrast, science fiction series that are not based on peaceful, collaborative conflict resolution are hugely popular in video games. This includes *Mass Effect* with three major games with a metascore larger than 90, *Star Wars* with 38 games with a metascore of 80 and more, and *Halo* with 14 games with a metascore of 80 and more.

Is it just a question of gamers wanting to shoot things? Let's take a look at what makes a video game work.

Cornerstones of Good Games

Making video and computer games is a creative task and – rather similar to making movies – no one can actually predict the success or popularity of a game in advance. Still, there are some basic principles that successful games have in common.

Meaningful Choices

Games are an interactive medium; so, players expect that they can make choices. These choices are very often micro choices, like choosing which bubble to burst next in *Candy Crush*, or which punch to trigger in fighting games. There are also macro choices, for example if the player wants to play a dwarf or an orc, or the choice of training one skill leaving another aside. However, all these choices have to have an effect, or a consequence showing players that their choices matter. Micro choices typically have immediate reactions, like when a non-player player blocks the chosen punch. Macro choices have longer lasting effects, like when people choose attack skills over healing powers in role playing games and end up dying of accumulated damage before the quest is even half-completed.

Immersion and Identification

A good video game draws players in. In immersive games, players should experience real emotions through personally internalizing the experiences conveyed by the gameplay. For a game to be immersive, players typically identify with the heroine or hero, e.g. by playing Commander Shepard in *Mass Effect*. Moreover, there are two ways to draw players in. The *empowered player* scheme is typically used for first person shooters. In this case the player is something special, i.e. an outstanding warrior, a superhero or a character who can fight for herself. The *disempowered player* scheme is typically used in horror, zombie and survival games. There, players are preyed upon and constantly fight for survival. Resources and information are scarce by default. In both cases, the game designer seeks to establish an unconscious relationship between the player and the character they are playing. This way, the character's experiences trigger unconscious reactions in the player's brain and nervous system. The sudden appearance of more on-screen zombies triggers real fear and a corresponding release of adrenaline in the disempowered player – provided she is truly immersed in the experience. Clearing a level or defeating a level boss causes the brain of the immersed empowered player to release endorphins, triggering real pleasure and a sense of accomplishment that is completely equivalent to one brought about by real-world success.

Challenging Resource Management

In most games there is at least one limited resource, like Tiberium in the game *Command & Conquer*, ammo and health packs in *Quake III Arena*, or limited time in *Z* or *Tetris*. Players must take action in an attempt to best use existing resources or acquire new ones. In some games, resources are needed for progressing from one level to the next. For example, in *Pokemon Go*, candies enable captured Pokemon to evolve and to be upgraded. As a player advances through a well-designed game, the high-speed reasoning required to maintain the equilibrium between these relatively complex factors becomes more and more demanding, forcing the player to move the processing from deliberate and conscious reasoning to unconscious reactions. This is faster and, when achieved gradually, it is much less demanding on the brain's resources [1]. When the action requires exactly the right balance of conscious and unconscious processes, the player can move into a sense of "flow" achieving a nearly timeless state where they truly feel that they are performing at their best [2]. This balanced state does not appear magically in the game, it must be deliberately built into the design, the programming, and the interface. Such "game balancing" requires extensive iterative testing, and is recognized as being a fundamental factor in creating a game that feels "addictive".

Progression and Achievement

In many games players start as novices learning the first steps in tutorial-like first levels. When characters progress through the stages of the game, they learn new skills and acquire new resources, items and weapons, while the player learns new game modes and objectives, and encounters new environments and enemies.

It is important to note that it is not only the character who is gaining new skills. The player is also learning the mechanics of interacting with the game, i.e. which buttons to push in which combinations. At first, all of these interactions must be deliberate but, with repetition, they become "learned reactions" – what most people mistakenly call "reflexes".[3] When reflexes work in combination, they are managed as learned patterns and processed in the hindbrain. In this way the separate mechanical interactions combine in a manner that feels seamless and intuitive. Once we have learned how, this is where we balance and counterbalance all of the reflexive actions and interactions that allow us to ride a bicycle, to run, or to juggle. During the learning stages, these actions have to be deliberately combined and synchronized. Once learned, the combination becomes unconscious and we can perform without having to think about each individual movement and how it effects the others. So, the firing

[3] Reflexes are reactions at the neurological level. They can be relatively simple, like when a doctor strikes your patellar nerve with a small rubber mallet triggering the tightening of some muscles and the relaxing of others so that your knee can extend and straighten your leg, or relatively complex, like when a sudden noise makes you jump.

pattern of a player hitting the right buttons in combination becomes as automatic and ingrained as the firing pattern of a soldier or a well-trained hunter.

To do any of that, the game must be played. This means that the player's learning curve must be delicately balanced with the amount of time provided and the complexity of the task to be performed. A challenge that seems flatly impossible will inspire most players to choose a different game, while a challenge that is too easy will be seen as boring and not worth the time. A challenge that feels as though it is pushing you to your limits, forcing you to do your very best in order to win, triggers the same reward chemicals in the brain as does real-world success. Even a small dose of success is addictive and can inspire an unconscious desire to repeat the experiences as soon as possible. A series of such experiences can unconsciously motivate a player to get "lost in the game", fully immersed in an unconscious cycle of stimulus and reward. Games that feel easy but addictive have perfected this balance.

There are also many deliberate and conscious rewards for progression through the levels of the game. These can include, but are not limited to, loot or trade goods, or success in farming, building, or mining. "Dungeon crawler" games like *Diablo*, or "open world" games like *Borderlands*, send players on quests, always searching for yet another, even better, weapon, armor, or ring. Players often also enjoy rewards for vertical achievements, like badges for walking a certain distance in *Pokemon Go* or for visiting the most remote places in open world games. What rewards, for both characters and players, could be built into a *Star Trek*-based game? What kind of *Star Trek*-based challenges would the player have to overcome?

Pros and Cons for a Game Set in the *Star Trek* Universe

In the *Star Trek* universe James T. Kirk (William Shatner) is often faced with critical decisions. It is actually one of the core concepts of *Star Trek: The Original Series* (*TOS*). Captain Kirk has to outweigh the life of one vs. the life of many, decide whether to save a group of individuals or a planet, whether to preserve a stagnant culture or free it, etc. His choices are often emotional and, when they involve women, they are typically one-sided. Spock (Leonard Nimoy), on the other hand, has no choice, but only a logical chain of arguments leading to the only possible action. However, this logical chain is typically challenged by an emotional struggle, or by the actions and opinions Kirk's other advisors. Doctor McCoy (DeForest Kelley) typically plays the role of the pessimist, giving voice to emotions, including fear, anger, and compassion. All the other members of the bridge crew, including Scotty, Uhura, Sulu, and Chekov, only get to make important decisions under extraordinary circumstances. Unnamed characters, especially redshirts, tend not to make any choices at all; they mostly die.

It is almost impossible to become immersed in a peripheral character. For example, only a subset of hardcore fans could identify immersively with Sulu because the general population doesn't know much about the character and his motivations. McCoy is better and more thoroughly known, but players do not typically identify

with pessimists. The role of Spock, on the other hand, may be playable. Self-identification with Spock is demonstrably part of contemporary popular culture, as can be observed in the role of Sheldon Cooper (Jim Parsons) from *TBBT*. The established character with the most clearly-defined possibilities as a character in an action-based game is the captain.

James T. Kirk can be understood as a classical computer game anti-hero, taking action against an ill-fitting universe. This includes hurried, intuitive and emotional decisions, aggression employed as a problem solver and the obvious bias towards charming, pretty women. However, the long-established *Star Trek* universe is actually conveyed as a peaceful place, where men and women are treated equally and where resources are managed by a rational and well-informed democratic committee, which also makes most of the critical decisions in a rational way. There is little room for an anti-hero.

Moreover, the *Star Trek* universe has plentiful resources. The warp core basically solves the scarcity of safe, usable energy, and replicators eliminate the scarcity of food. Education is basically free for all, and there is no currency to speak of. Scarce resources, therefore, are extremely hard to fit into the Federation space. One would have to look beyond *TOS* to find challenges in resource management, e.g. in *Star Trek: Deep Space Nine* (*DS9*), where there is currency, poverty, etc.

Another major obstacle for game development in the *Star Trek* universe is the lack of character progress. Achievements, like saving a planet or successful negotiations, are not carried over from one episode to the next. Again, we have seen this with characters from the latter series in the franchise, but not in *TOS*.

Finally, from a visual point of view the *Star Trek* universe has a huge advantage over other universes. It follows a very modernist design. Fonts and ornaments are straight and architecture is based on straight lines or simple curves. There is also no dirt or trash visible and the light and shadows are easy to reproduce on the computer based on ambient lighting with soft shadows. Nearly everything is new and shiny, worn out rugged or aging objects do not need to be considered. Most aliens are humanoid and walk, talk and gesture like humans, meaning already existing animation patterns can be applied.

Boldly Going

Going through the cornerstones of good games and relating them to core concepts of *TOS* makes it possible to see the strengths and possibilities for game development. It is obvious that progress and achievement on a numerical or skill level is not possible, if one is playing a core character. At the same time, immersion and identification can really only work for James T. Kirk or Spock (though it is Kirk who would fit into the traditional parameters of a video game hero). Resources are far too plentiful in the *Star Trek* universe to be of significance in a potential video game, besides crisis management, i.e. medicine for a plague is not available in time, fast decision making, etc.

All in all, this matches very well with a current video game genre, the story driven games. There, players typically identify with one or more characters and follow and decide upon the course of a story through a pre-defined universe (e.g. *The Walking Dead* or *The Wolf Among Us* from Telltale Games, or *Life is Strange* from Dontnod Entertainment). Interaction of players is based on walking their avatars through the world and experiencing it through exploration and small puzzles as well as on dialog options that change the story. There is no reason that this could not work with *Star Trek*; well, there is one.

The principle obstacle with *Star Trek* is licensing. Obtaining a license for work that is based on *Star Trek* is excessively expensive, and even fan art is not allowed by Viacom, the license holders. Many of the video games that have been set in the *Star Trek* universe were published by Simon & Schuster, a subsidiary of Viacom. However, all in all, with the current game market including casual games, story driven games, consoles with a large user base, and eventually virtual reality, it should be possible to make a successful *Star Trek* game so long as the player is challenged to make meaningful choices, in an immersive and identifiable role, and so long as progress and achievement are built into both gameplay and the underlying story. Let's take a brief, informal look at how that could be achieved.

A Proposal: Seeking Out New Life and New Civilizations

Imagine a game similar to *Pokemon Go*, but set in the world of the *Star Trek* franchise. Instead of being a Pokemon hunter, you are a member of Starfleet. Instead of trying to capture new Pokemon, you are trying to catalog new information about native and extraterrestrial artifacts on this planet. Like in *Pokemon Go*, you can work alone or with others, and you may encounter other players or NPCs as you wander or race through the real world looking for clues and hidden items. Your immediate goal is to capture images, sounds, and other facts about the science, technology, and cultures of this planet, and to add that data to the Starfleet database. New data is good, but replication and validation of data submitted by others is also valuable.

During your travels you may encounter Gary Seven and his secretary, or time- and space-travelling characters from any incarnation of Starfleet. You can choose to help them meet their short-term or immediate goals, while continuing your own mission. At the same time, you may have to survive encounters with Klingons or Romulans, or even a Gorn, or the Gamemasters of Triskelion. Figure out how to speak in analogies and metaphors in order to help a lost alien find his way back to his transporter beacon. Share information and insights with other members of Starfleet, in order to increase the odds that it reaches the home database, but do not share anything truthful with that cleverly-disguised Andorian spy.

At home, you can search through the database and look for previously undiscovered patterns in what is there. Present your results to the community, recruit helpers to investigate your own theories, and help others investigate theirs. This could include participating in any number of real world "citizen science" projects, or even linking your own computer's downtime to SETI and other scientific research

endeavours that ask the public to volunteer processing power, whether it is situated in silicon chips or carbon-based life as we know it.

Conclusion

We have proposed that it is theoretically possible to design a video game set within the world of *Star Trek: The Original Series*; a game that would suit the overall game-playing community, without alienating the franchise's established fan base. As a reflection of our belief that there are currently multiple successful video game ideas that would allow for the implementation of a meaningful game set in the *Star Trek* universe, and as an example of the concepts and exercises we use with our students, we have proposed one such game. We invite Viacom to do the same.

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To Seek Out New Forms of Knowledge: Viewing *Star Trek* as an Introduction to Cognitive Science and Ways of Thinking About Narrative, Theory of Mind, and Difference

Vivian Fumiko Chin

Abstract

Introducing the combined perspectives of a cross-disciplinary approach can enhance the study of narrative in the college classroom. While cognitive psychologists have posited that theory of mind, or the functioning of a mirror mechanism to engage empathy, is more likely to occur through literary fiction than through popular fiction, the various iterations and episodes of *Star Trek* provide ways to experience empathy and respect for difference. To begin to explore the strange new worlds now available to us through the fMRI and the research of neuroscientists, and to apply these ways of knowing to an analysis of narrative can contribute to an enriched understanding of how texts work as cognitive functions worthy of study as such. Further, a consideration of metaphor as a method of bridging differences can occur through an examination of examples from *Star Trek*. With these interpretive tools, we can introduce new modes of thinking about narrative and difference.

Keywords

Cognitive science · Empathy · Narrative functions · Popular culture · Theory of mind · Othering · Difference

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Editors' Log: Chapter 13

Star Trek is known for promoting understanding and cooperation among those who are visibly and invisibly different from one another. Vivian Fumiko Chin uses literary and pop-cultural metaphors to gain insights into the cognitive tools that allow humans to develop an understanding that the people around us are also capable of independent thought, and have inner lives similar to our own. The following chapter illustrates the use of text and context to gain insights into one of the touchstones of the *Star Trek* franchise; the ability to see humanity in others. **(Eds.)**

***Star Trek: The Original Series*, 01×18, "The Devil in The Dark" (1967)**

Spock: *Curious. What Chief Vanderberg said about the Horta is exactly what the Mother Horta said to me. She found humanoid appearance revolting, but she thought she could get used to it.*

McCoy: *Oh, she did, did she? Now tell me, did she happen to make any comment about those ears?*

Spock: *Not specifically, but I did get the distinct impression she found them the most attractive human characteristic of all. I didn't have the heart to tell her that only I have them.*

Kirk: *She really liked those ears?*

(continued)

Spock: *Captain, the Horta is a remarkably intelligent and sensitive creature, with impeccable taste.*

***Star Trek: The Next Generation*, 05×02, "Darmok" (1991)**
Riker: *Greek, sir?*
Picard: *Oh, the Homeric Hymns. One of the root metaphors of our own culture.*
Riker: *For the next time we encounter the Tamarians?*
Picard: *More familiarity with our own mythology might help us to relate to theirs. The Tamarian was willing to risk all of us just for the hope of communication, connection. Now the door is open between our peoples. That commitment meant more to him than his own life.*

Introduction

To boldly go where no one has gone before involves moving across disciplines to seek out new methods of understanding. In the classroom, brief introductions to various modes of thought from different disciplines do not result in mastery of these disciplines, but can introduce fields of study and encourage students to reflect on how disparate fields can converse with each other to engender insights. Touching on cognitive science and the study of narrative can spark "aha!" moments when combined with a consideration of difference and the mechanics of Othering.[1] How the mind and brain work, how narrative functions, and how these inquiries might come together in thinking about how difference is conceived can become an extended teachable moment when placed in a dialogue with *Star Trek: The Original Series* (*TOS*) and its offshoot, *Star Trek: The Next Generation* (*TNG*). Scenes from these two television series provide examples that allow for the practice of analytical skills.

Noting how neuroscientific research and its popularized versions are foreshadowed in these two *Star Trek* series can inspire further investigation. A desire to understand the relationships between cognition and the human brain, and the drive to map out emotion, language, or what makes us human onto brain cell activity is an example of metacognition or thinking about thinking. This process may not require a detailed understanding of, for example, the research on mirror neurons, but demands a general awareness of the work of cognitive science. This awareness can prompt questions such as, if the human brain operates in measurable and generalizable ways regarding cognition, what might we learn about the ways that humans perceive and determine what constitutes difference among people, or how we understand the actions of others?

[1] Here, Othering receives an upper case O to mark its use as a theoretical term, particularly in reference to the work of Edward Said. See, e.g., Said, Edward W., *Orientalism*. Vintage, 1979.

Theory of Mind and Empathy

Theory of mind refers to a focus in cognitive science that concerns the awareness of a relationship between self and others – an awareness that others may have a world view including beliefs, desires, and intentions that differs from one's own. This is one small step towards understanding that differing world views may be as valid as one's own.

In a study that combines quantitative methods with qualitative methods, psychologist researchers attempted to prove that "Reading Literary Fiction Improves Theory of Mind". This work distinguishes literary fiction from popular fiction – "set apart from most best-selling thrillers or romances" [1, p. 377]. According to the authors, theory of mind, or "The capacity to identify and understand others' subjective states is one of the most stunning products of human evolution. It allows successful navigation of complex social relationships and helps to support the empathic responses that maintain them" [2, p. 377]. In other words, theory of mind allows for empathy because it is what enables one to understand that others have mental states of their own, and those mental states can be *different* from one's own. Following a series of five experiments, the researchers argue that their findings underscore the importance of teaching literature in secondary education in the United States, a commendable position. Despite this research, could it be possible that less literary narratives, even those of television serials, have the potential to nurture empathy and a complex appreciation for difference?

Look, a Mirror Mechanism

Cognitive science is commonly considered an interdisciplinary study of the mind and its processes, and "its concepts and models can be interpreted in terms of domains of phenomena consisting of humans, animals, and machines. As such it constitutes a high-level tool of inquiry which may serve to integrate findings from diverse domains" [3, p. 271]. The hypothesized functioning of a mirror mechanism in humans has received attention from polymaths, a bestselling neuroscientist, and popular media, in addition to scholarly sources.[2] Interested students can conduct quick research via internet searches to familiarize themselves with ongoing discussions regarding the distinctions between hypothesized mirror neurons and a mirror mechanism to better understand the controversies these discussions engender. Discussions of mirroring behavior appear in the mainstream news with a neuroscientist contrasting the "mirror mechanism" to theory of mind [4].

Researchers continue to explore the processes of the brain as one experiences oneself as both connected to and separate from others. "Through the Looking Glass:

[2] See for example, Ramachandran, V.S., (2011), especially chapter 4, for a discussion of mirror neurons that is aimed at the layreader [6].

Self and Others" (2011), a paper produced by the Corrado Sinigaglia and Giacomo Rizzolatti, states that this work discusses:

> …the relevance of the mirror mechanism for our sense of self and our sense of others. We argue that, by providing us with an understanding from the inside of actions, the mirror mechanism radically challenges the traditional view of the self and of others. Indeed, this mechanism not only reveals the common ground on the basis of which we become aware of ourselves as selves distinct from other selves, but also sheds new light on the content of our self and other experience, showing that we primarily experience ourselves and the others in terms or our own and of their motor possibilities respectively [5, p. 64].

While some researchers have asserted that regarding studies with primates, "After two decades of research it is established that a similar mirror mechanism is also present in the human brain" [6, p. 164], the debate continues. This statement receives an endnote that "the possibility to firmly establish the existence of mirror neurons in the human brain on the basis of indirect evidence from brain imaging experiments has been challenged for many years" [7, p. 164]. Although a mirror mechanism is likely, it is not likely that this mechanism is the work of so-called mirror neurons.

Star Trek + POP CULTURE = POWER/POLITICS

Although *Star Trek* is not literary fiction, it presents us with fictional worlds that may affect viewers in significant ways. The continuing saga of *Star Trek* is a narrative that has grown beyond the original series. A viewer who is very familiar with *Star Trek* narratives from the original *Star Trek* to the successive *Star Trek* themed television serials and films would likely argue that the television series are able to offer more nuanced narratives than the films. How the mind responds to narrative in general is the focus of a clearly named anthology, *Narrative Theory and the Cognitive Sciences* (2003). The editor praises the interdisciplinary collaboration in this resulting field, explain that "This book demonstrates how a group participating in a collective endeavor – in this case, an inquiry into the common ground between theories of narrative and research in the cognitive sciences – forms a system or gestalt that is 'smarter' than any of the individuals making up the system" [8, p. ix]. This editor further notes that "…stories are found in every culture and subculture and can be viewed as a basic human strategy for coming to terms with time, process, and change" [9, p. 2]. Such a view of stories serves well in the analysis of narrative.

To return to *Star Trek*, various episodes of *TOS* and *TNG* provide dramatizations of empathy, respect for difference, epistemology, and myth-making. *TOS* ran from 1966–1969, following what is commonly known as the cognitive revolution of the 1950s, which at that time combined psychology, anthropology, and linguistics with artificial intelligence, computer science, and neuroscience. *TNG*, which was originally broadcast from 1987–1994, overlapped with the advent of functional magnetic resonance imaging (fMRI), a non-invasive measuring of brain activity. In the early 1990s, advances in cognitive science appeared in, for example, a foundational article regarding mirror neurons published in the journal, *Experimental Brain Research* [10].

A *Star Trek* expert would know exactly which episodes of either series explicitly mention cognitive science, but even without a Trekkie's knowledge of *Star Trek*, we can look at aspects of *TOS* and *TNG* with an eye for narrative elements that involve noteworthy encounters with the Other and empathetic interactions with aliens.

The ongoing *Star Trek* narrative expresses similar and dissimilar ideologies throughout its variations, while *TOS* and *TNG* typically reflect the duties of peacekeeping missions that may call for short term battles. The politics of difference in *Star Trek* narratives are unstable, yet some episodes express more than a tolerance of difference, but a voyage toward long term peace and respect. Just because alien beings are clearly different from the human crew and may not share the crew's perspectives does not mean that they must be killed. Moreover, expert viewers can cite the Vulcan value of "infinite diversity through infinite combinations" that first appears in the original *Star Trek* as an expression of an appreciation for difference in *Star Trek*.

Popular culture can help us understand theoretical concepts and the politics of representation when we recognize it as not merely a source of entertainment but as a replicator of ideology. Although a fear and hatred of difference may appear in narratives involving non-Earthlings like the Ferengi, the Romulans, and other unfriendly beings; and a decidedly anti-Communist perspective may manifest in narratives of the Borg, the cast of the original *Star Trek* embodied the zeitgeist of the later 1960s with its uncommonly racially diverse cast. Yet entrenched modes of understanding race repeat themselves. Spock enacts the trope of the tragic mulatto, always needing to remain persistent in pacifying an ongoing inner conflict between emotions versus logic caused by his hybrid origins of both Earthling and Vulcan. His genetic constitution does not easily exist in harmony. At times, he is regarded with suspicion by both Vulcans and humans but one might argue that throughout the original series, ultimately, when conflicts regarding Spock's difference as a Vulcan arise, the crew's respect for him wins out and he is accepted as part of their community. Throughout *TNG*, character Deanna Troi (Marina Sirtis), who is both Earthling and Betazoid, seems to experience this dilemma with less intensity – instead her memorable conflicts are depoliticized, involving the personal – such as her relationship with her domineering mother – rather than a parallel that is charged with racial politics – such as a need to repress inherited, racialized traits.

Star Trek and Empathy

The *TOS* episode, "The Devil in the Dark" [11] provides a means to imagine altruism towards a disgusting body, and suggests that empathy can end violence. In this episode, a landing party made up of *Enterprise* crew members assist a mining operation run by settlers on a planet far from Earth, whose work is being sabotaged by a hostile, monstrous being. This saboteur turns out to be a protective mother Horta who is experiencing genocide as the miners kill her eggs. Healing transpires when the character Spock (Leonard Nimoy) prevents a potential mass killing by practicing an assertive method of empathy, and a human physician, Dr. McCoy (DeForest

Kelley), is able consider an abject being his patient. Through a mind meld with Spock, made possible by his Vulcan descent, Spock is able to vocalize the Horta's thoughts, and we hear the mother Horta lament, "The end of life…" Despite this creature's low tech scatological appearance, we can empathize with her experience and her fear of the mass murder of her species. Spock serves as a conduit through which the Horta can speak, giving voice and speaking for her, yet apparently not asserting any power over her speech. Responding to the call to heal the Horta, Dr. McCoy exclaims, "I'm a doctor, not a bricklayer!" This complaint echoes his remark, "I'm a doctor, not a coal miner" in an episode titled, "The Empath" [12], and figures throughout the series as a characteristic phrase. McCoy may express uncertainty about his abilities, but he goes on to perform work that he at first may consider beyond his skills. His consideration for the wounded or sick surpasses his possible desire to remain in a professional "comfort zone". In a scene of healing in "The Devil in the Dark," issues regarding translation, differences, as well as fear transform into a memorable drama. In a reversal of the episode's title, it is possible that the crew members are the ones in the dark about the exact nature of the mother Horta until they become empathetic to her condition.

Students in a course that focuses on power, difference, and the mechanics of Othering, may be quick to judge Dr. McCoy's catchphrase as a sign of his elitism. I'm an x not a y, where x is a physician, suggests that his prestigious position as a doctor of medicine makes other forms of labor beneath him. Primed to uncover examples of oppression, these students' quick judgment would clash with that of many familiar with *Star Trek*. Those well-versed in *Star Trek* would vehemently oppose such an interpretation.[3] Such a difference of interpretation provides a moment for reflection on cognition and decision-making.

TOS and *TNG* offer empathic role models in the characters of Gem and Deanna Troi. An episode of the original series, "The Empath" presents scenes of torture and unethical experiments on the crew. Their injuries are miraculously healed by an unnamed woman, named Gem by Dr. McCoy to signify her rare and desirable qualities. Gem cannot speak, but exhibits enviable skills. According to McCoy, she demonstrates, "Complete empathy. She must be a totally functional empath". The doctor expresses awe regarding her functionality in medical terms, "Her nervous system actually connected to yours to counteract the worst of your symptoms and with her strength, she virtually sustained your body's physiological reactions" [13]. The empath's skills are not pathologized but are considered with a physician's eye and valued. The figure of the empath evolves in *TNG* – Counselor Deanna Troi can speak, and plays an ongoing role in providing more knowledge through her genetically acquired abilities to sense the emotions of others. Both Earthling and Betazoid, Troi does not experience the conflicts of the tragic mulatta, although her human ancestry weakens her Betazoid telepathic powers to intuitive powers. As a series regular, her presence not only speaks of her ability to keep the viewer's attention by virtue of her décolletage, but of the significance of, or curiosity towards, empathy as a mode of interaction and way of knowing.

[3] I thank the editors for pointing this out.

Empathy, Metaphor, and *Star Trek*

Arnold H. Modell's important work, *Imagination and the Meaningful Brain*, engages with the work of many, including linguists and philosophers, contending that "metaphor is primarily a form of cognition rather than a trope or figure of speech. …metaphor finds its source originally in the body, and … becomes the selective interpreter of corporeal experience" [14, p. xii]. The connection between empathy and metaphor receives attention from Modell: "Empathy involves a sense of similarity while maintaining a sense of difference. To experience the simultaneity of a similarity and difference requires the acceptance of paradox, which in turn rests on the cognitive capacity for metaphor" [15, p. 175]. Metaphor works like an equation in which x = y, or my love is a rose. The metaphor serves as a bridge across two differing variables, connecting them to reveal much about how we process and produce meaning. In the realm of metaphor, we understand that the make-believe universe of *Star Trek* is a cognate for our everyday world. This allows us to translate its narratives to ours, to consistently place ourselves at the center, and to produce a collective "we" through this process.

A long term aficionado of *Star Trek* likely has an affection for specific episodes, yet explaining this fondness may prove as fruitless as explaining a joke. Here, one such challenge involves the episode, "Wink of an Eye" [16], in which Captain Kirk (William Shatner) is sped up to match the rhythm of aliens who inhabit a different time frame. In everyday life, metaphors of speed pathologize and insult by naming another as "retarded" or "hyper" – either too slow or too fast in thinking and behavior. In "Wink of an Eye," when Kirk is able to merge into the accelerated speed of the aliens who move at such a rapid speed that they are invisible, the possibility for empathy with those who operate at a different rate of speed may emerge. A highly unlikely dramatized situation can nonetheless connect with everyday reality. Today, college students are diagnosed with such conditions as depression, bipolar disorder, ADHD (Attention Deficit Hyperactivity Disorder), and Executive Function Disorder, conditions that may slow or speed up one's way of being.

A deep understanding of metaphor, myth, and multiculturalism eventually manifests in *TNG* when Captain Picard (Patrick Stewart) finally understands that an unfamiliar alien is speaking in allegory. In the episode, "Darmok" [17] Picard urges an alien to "Give me more about Darmok." The universal translator fails when the crew encounters those who speak in untranslatable allegory, but they can nonetheless comprehend each other by accessing the mechanics of myth and insider knowledge. Viewers are invited to consider how metaphors are us, how mythologies and allegory shape our understanding. Even without a knowledge of specifics, the structure of the story becomes apparent. "Darmok on the ocean, a metaphor for being alone, isolated, Darmok on the ocean," Picard intones, at last comprehending the necessity to have empathy for an unfamiliar culture through its narrative framework. In everyday reality, the buzzwords "multiculturalism" and "diversity" can receive more sophisticated meanings when combined with a consideration of epistemology, the power of myth, and cultural capital.

Star Trek produces empathetic responses via its representations of unfamiliar life forms who are represented via cheesy, low-budget, or unsophisticated special effects and make up. From the abject mother Horta to aliens, *Star Trek* shows us that those who are unmistakably Other are worthy of respect and not killing. One might argue that the unmistakable artifice of the special effects and make-up of the early *Star Trek* dramas make its lessons easier to accept, because they are dramatized in such a blatantly imaginary manner.

It is a useful or at least entertaining cognitive exercise to consider how the brain might function when receiving data from the enduring and evolving narratives of *Star Trek*. To better understand or hypothesize about cognitive functioning, the practice of reviewing a popular text for its methods of inventing fictional worlds can be fruitful on a meta level. How do we think about a narrative like *Star Trek*? Even if we misremember and rewrite episodes of *Star Trek* to fit our needs, these revisions can reveal much about both who "we" are and what these needs might be.

Viewing the previous examples from *Star Trek* in the classroom can help us begin to think about how a mirror mechanism, theory of mind, empathy, and metaphor might be related. These possible relations as well as issues involving how we learn empathy, how we think about empathy, and how narrative can teach us empathy are matters we can become aware of by ruminating on aspects in *Star Trek* narratives. Moreover, the ideological and psychological functions of narrative can also become more clear as we engage in close readings, analyzing specific scenes, as well as participating in "distant readings" that place narratives in larger socio-historical and cultural contexts [18].

An Emerging Lesson Plan, a Possible Assignment

Talking about *Star Trek* in a classroom of students unfamiliar with this narrative can prove challenging. Bringing *Star Trek* into the classroom can also give students the opportunity to witness and participate in an enthusiastic and critical consideration of an abundance of stories they might otherwise dismiss. *Star Trek* minutiae may be relentlessly pursued by avid fans, however, such arcane knowledge is not necessary for an introduction to interpreting specific scenes. Convincing students of this may help to prevent their eyes from glazing over as they assume that their lack of experience in viewing *Star Trek* makes its consideration unfathomable. With only a few students who have a history of watching any version of *Star Trek* present, projecting images through a digital presentation can help familiarize students with specific scenes. Additionally, priming students to look for moments of Othering, or the exoticizing of difference in recent *Star Trek* films can stimulate them to become more conscious viewers who can spot ideology in action.

Fiction need not be considered literary to encourage the imagination. While students may be more familiar with the advertising slogan, "Think Different," rather than the actual practice of thinking differently than through a flawed, automatic thought process or from how they have been taught to please their teachers, presenting the lesser known Vulcan ideology of infinite diversity through infinite

combinations (IDIC) can spark an impetus to think in a truly different manner. Engaging students to conduct research through mainstream and scholarly search engines using such crossover search terms as neuroscience and racism; fiction and psychology; empathy and literature can encourage students to seek out new forms of knowledge. The numerous *Star Trek* narratives are widely available through streaming online sources. Students can select clips to analyze, and can apply theoretical frameworks from various combined disciplines in order to uncover new interpretive possibilities.

Although we may not reach mastery of these briefly visited disciplines, an introduction to their perspectives can help guide us towards more nuanced ways of thinking. In addition, when we understand metaphor as the holding of opposing thoughts, we can acknowledge that we have experience in this behavior and accept possibly conflicting interpretations. As we venture in this direction, we can be mindful of our cognitive practices, becoming more open to a critical view of our thinking that includes an awareness of metacognition or how we think.

Acknowledgments An earlier version of this piece was shared with my students in Spring 2016, from the rough draft of the abstract that they helped me to revise, to providing feedback on a five-minute digital presentation and talk produced for an academic conference that celebrated *Star Trek*. In Fall 2016, as I endeavored to evolve this discussion, I shared the process of revising from an oral presentation to a written work with a number of classes, hoping to demonstrate how writing is a continual process that ideally results in a coherent and persuasive argument. This work remains ongoing. I plan to present and refine assignments from this work in the upcoming term. In these ways, I have engaged with *Star Trek* in academic settings. My son, who enjoyed watching *TOS* and *TNG* as a child, contributed suggestions with humor. My cat assisted by walking on the keyboard as I typed. I am most grateful to the editors for their attentive comments.

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La Forge's VISOR and the Pictures in Our Heads: Understanding Media Studies Through *Star Trek*

Nathanael Bassett

Abstract

Media studies involves looking at more than what we see on a television screen. It focuses on one of the inescapable aspects of human experience – the relationship between people and technology ("technics" [1]), and the mediation of our experiences. We never experience phenomena directly. Instead, our experiences are mediated through things between us and the world. Media studies explores both content and form of media. It focuses on the relationships that different types of media foster, the messages we receive via a medium, and the material qualities of artifacts and systems through which we experience the world. Geordi La Forge's VISOR, as found in the fictional world of *Star Trek*, is a prime example. It is both "the medium and the message", in Marshal McLuhan's terms [2]. Beyond the example of the VISOR, all of us depend on complex socio-technical systems to mediate our experiences. Media studies works to reveal how these systems contribute to our lives and help to constitute our social world. Drawing from many different disciplines, media studies scholars investigate the means of communication we otherwise take for granted.

Keywords

Media studies · Communication · Mediation · Technology · Epistemology · VISOR · La Forge

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Editors' Log: Chapter 14

How often have we heard someone in *Star Trek* – usually the captain – give the command, "On screen!"? The main view screen on the bridge of the various starships is one of the main windows to the universe for the respective command crews; and, by extension, it is also one of the main windows for us as the viewers. The view screen displays awe-inspiring stellar phenomena, alien planets from an orbital vantage point, and the occasional translucent face of an omnipotent being floating in the depths of interstellar space. A vast array of sensors augments these views, detecting everything that is not visible to the naked eye (except for the occasional Romulan ship, cloaked off the starboard bow). These sensors and displays are part of a complex of interfaces that mediate between perceiver and the perceived. Everything is mediated. Human eyes are mediating mechanisms, just like any other ocular input that aliens might possess. So is Geordi La Forge's VISOR. Media studies scholar Nathanael Bassett literalizes the metaphor inherent in La Forge's prosthesis, and takes a critical look at the basic tenets of media studies and media literacy. (**Eds.**)

***Star Trek: The Next Generation*, 01×01, "Encounter at Farpoint" (1987).**
Riker: *Have you noticed anything unusual?*
Data: *I can't see as well as Geordi, sir, but so far the material seems rather very ordinary.*
Riker: *Construction records?*

(continued)

Data: *Construction records show this to be almost identical to that which Starfleet uses.*
Tasha: *Team Leader. We've found something interesting. We're in a passageway directly under the station, sir.*
La Forge: *But these tunnel walls are something I've never seen before, sir.*
Riker: *How are you examining them?*
La Forge: *In every way. Microscopically, thermally, electromagnetically. None of it is familiar.*

Introduction

La Forge: [Taps his visor] It translates a wide range of radiation into neural impulses. Allows me to see.
Bochra: Without it, you're blind?
La Forge: Yes.
Bochra: How did this happen?
La Forge: I was born that way. [3]

In *Star Trek: The Next Generation* (*TNG*), Geordi La Forge (LeVar Burton) is the chief engineer of the *USS Enterprise-D*. He was born blind and wears a Visual Instrument and Sensory Organ Replacement (VISOR) to see, a device that looks a bit like a hairband over his eyes. But the VISOR does not just restore his sight – it augments his vision in a way that is useful and unique, allowing him to perceive the entire electromagnetic spectrum. Sometimes La Forge is able to examine things in ways other instruments cannot, and in extreme scenarios he can reconfigure it to serve as a rescue beacon or even a weapon. By passing the signals it receives through neural implants in his temples, it helps him create a picture of the world for himself, which includes more information than that of the typical human Starfleet officer. The VISOR is an excellent metaphor for how we all perceive the world differently depending on the information available to us. In talking about media studies, I am going to focus on La Forge's relationship with his VISOR and how its use affects his experiences.

The VISOR creates a very specific sort of world for La Forge, very different from the one the rest of the crew sees. Walter Lippmann once argued that although we all live in the same world, we "think and feel in different ones", or "pseudo-environments". These "pictures in our heads" are consist of our biases and our limitations in understanding everything that goes on [4]. Thus, they can easily be manipulated by experts. They prevent us from ever having a truly democratic public. If this sounds cynical, John Dewey believed that the public could understand the world and participate democratically, given the correct conditions, public education and the right technology [5]. This is one of the oldest debates in communication studies (one of the ancestors of media studies research). How do media change the way we relate to each other? How does the way we communicate change the sort of political relationships we can have?

Dewey also thought technology could distract people from important issues. Likewise, La Forge has to learn to filter signals from his VISOR and differentiate between the right ones and the ones that aren't as important. Too much visual 'noise' makes what he sees incomprehensible. Like any piece of Starfleet technology, he has to learn and train in order to use it effectively. His VISOR is a sophisticated lens through which he can understand reality in unique ways. And, La Forge can literally alter his outlook as it suits him. Data (Brent Spiner), a sophisticated android and fellow *Enterprise* crew member, is the only other individual on the ship who can deliberately control his senses. Perhaps this is why he and La Forge are such good friends – none of their peers can adjust their experience of the world in the same intentional way.

The rest of us are not so lucky. To adopt new perspectives, we also have to train for it, but sometimes we forget that focusing on one thing means ignoring others. Social scientists try to be conscious of the way one can become acclimated to specific theoretical orientations, methodologies, or the political implications those outlooks carry. Created by our training, the "pictures in our heads" result in a variety of valuable insights which can answer different questions. If we want to know about the structure of political networks on social media platforms, we can ask a quantitative social network analyst. However, if we want to know about the subjective meanings created by people in those groups and what is relevant and important, another researcher could provide a critical discourse analysis. Both are forms of media studies, but each has a different perspective, much like how La Forge and Data are both Starfleet officers, but with different abilities and roles in the crew. This is one of the most important points about media studies. It it is inherently interdisciplinary – meaning, it can take many different forms. But the purpose of media studies research is always to understand how media change the way we understand and experience the world.

"A Fly on the Wall"

Rasmussen: It'd be best if you just thought of me as a fly on the wall, and went about your business…
Rasmussen: Um, your... prosthesis. What do you... what do you call it again?
La Forge: A VISOR.
Rasmussen: VISOR, right, a VISOR! You know, I have a picture of you wearing that in my office. How do you like it?
La Forge: It allows me to see. I like it just fine.
Rasmussen: You know, Homer was blind. And Milton. Bach. Monet. Wonder...
La Forge: A fly on the wall, huh?
Rasmussen: A fly on the wall. [6]

In the *TNG* episode "A Matter of Time", Berlinghoff Rasmussen claims to be a professor from the twenty-sixth century, studying history by traveling through time to visit the *Enterprise-D* centuries before his time. It's fortunate that this isn't really the case because his methods are pretty sloppy. He distributes surveys while claiming to be only observing, he interferes with the crew's performance,

and he generally behaves in a rather disrespectful and unprofessional way. All researchers grapple with questions about what and how we can know things. This involves both a philosophy of knowledge and methods. In media studies, there are multiple approaches.

First, all social science is an attempt to explain the cultural world in a way that we can appreciate. While natural sciences make quantitative measurements like the distance between planets, or explain complex physical phenomena like the behavior of particles, social science works towards understanding people and relationships in a society. These attempts include a wide variety of methods and philosophies about how we can know the things we know, with complicated disagreements informing the sorts of questions researchers ask and how they go about trying to answer them [7]. Generally, social sciences are distinguished by the object of their study. Media studies draw from the fields of mass communication, rhetoric, theater and performance studies, public opinion, journalism, and marketing (to name just a few). Additionally, media studies and its parent, communication studies, involves media history, from early speech through writing, printing, and the advent of electronic media, including broadcast, film, video, and so-called "new media" [8]. Media and technology always change and consequently, context always determines what's considered 'new'. Technology and media are also tied to each other. New types of technology give rise to new forms of media and the potential for mediations we have never experienced. Virtual reality and the holodeck are clear examples. The technology of force fields and projections allows La Forge to simulate experiments and go on dates in places that wouldn't exist otherwise.

If these perspectives seem like a wide net to cast, the people casting it travel in many different boats. They include rhetoricians, semioticians, phenomenologists, cyberneticists, socio-psychological researchers, and scholars from socio-critical and critical perspectives [9]. More recently, science and technology studies (STS) [10], and software studies have created even more overlapping lines of research, as well as philosophy of technology, gender, critical race and post-colonial studies [11]. These differing perspectives and other historical academic debates are why communication – the fundamental activity of media – is a somewhat amorphous concept. It can be irregular across universities and even between individual researchers [12]. Clearly any attempt to describe media studies or the broader discipline of communication will render an incomplete picture. This isn't an obstacle to understanding these kinds of research so long as we acknowledge its incompleteness. Humans are the instruments of social science, and we're all subject to our own social whims and shortsightedness.

The "fly on the wall" approach Rasmussen claims to take is reminiscent of historical ethnography, where people would insist that they could study a social environment without affecting it by their very presence. But his aloof nature hides a more sinister purpose. Rasmussen is actually from the past and wants to steal technologies so that he can "invent" them before their time. La Forge can see many things, but his VISOR can't reveal the scam artist's ulterior motives. And although Rasmussen steals one of La Forge's spares, it's unlikely he could appreciate what it would show him without the neural implants.

The point is that media studies works like a VISOR. It provides us with a view of the world that depends on our training and what we want to understand. All of us wear a metaphorical VISOR, and the ones worn by scholars and researchers in this field depend on the dispositions and interests they have at heart. Additionally, incomplete and or inconclusive pictures can be adjusted by way of further study.

"What's normal?"

> La Forge: It's called a VISOR. It enables me to see.
> Hedril: Like my vocal enhancer. It helps me make sounds. [13]

When La Forge looks at the world, what does he see? Is it an accurate picture? If there is some sort of interference, he might see things that are not there. This is especially ironic in the case of the holodeck, where projections and force-fields create artificial presences. The holodeck is a sort of deliberate interference, but typically La Forge can trust his senses and believe what he sees.

The idea of being able to believe what we see is similar to a philosophical theory called positivism. Natural sciences rest on this epistemology (i.e. how we can know the things we know) of scientific observation and empirical evidence. Since academic social sciences emerged after the natural sciences, it follows that many researchers originally saw themselves as measuring a social world and trying to prove hypotheses from this objective and rational viewpoint. In the United States, media studies is linked with a history of communication studies, which originated with a distinctively positivist outlook. Researchers believed that they could produce results that accurately reflected the world. This sort of epistemology directly impacted the kind of methods they used and the results that researchers thought that they could see. There was an objective world to be studied and captured through the scientific method.

> Soran: Have you ever considered a prosthesis that would make you look a little more... how can I say... more normal?
> La Forge: What's normal?
> Soran: "What's normal?" Well, that's a good question. Normal is what everyone else is and you are not. [14]

By way of a somewhat complicated arrangement, Tolian Soran (Malcolm McDowell) is involved with the infamous Duras sisters in *Star Trek Generations* (*ST:VII*). He has their support to build trilithium weapons, which they presumably want to use to regain power in the Klingon Empire. Soran's goal is to redirect the Nexus, a ribbon of energy which takes people into an extra-dimensional space shaped by their dreams and desires, something like the ultimate intuitive holodeck. To do this, he captures La Forge and taps into his VISOR, allowing the Duras sisters to see exactly what the *Enterprise-D*'s shield frequencies are, which allows the Klingons to bypass the ship's defenses. That insight makes the significantly weaker vessel much more powerful. This sort of direct observation relies on accuracy, i.e. the knowledge that the Duras sisters were seeing exactly what La Forge was seeing. This is also the way quantitative researchers try to work, to find direct relationships,

problematize variables, and use statistical analysis to understand how media can effect public opinion, private attitudes, and so on.

Historically, early communications researchers believed that they could measure and understand the direct effects of mass media with total objectivity, resulting in what they call the "hypodermic needle" model [15]. In part, this stemmed from early communications scholars' interest in propaganda as a way to control and influence the public [16]. Later, they acknowledged that there were "limited effects" at best, and today, it can be very hard for us to assume we know what "normal" is – a large "paradigm shift" in academia itself was part of this [17, 18]. People in many disciplines were uncertain of how to accurately and honestly reflect the world in their work. Different ideas about how we can know what we know changed the type of questions people asked and how they answered them.

In this sense, communication and media studies share a lot of the same methodological diversity as other fields. People who work under the epistemology of "post-positivism" believe we can use the scientific method to understand an approximate reality, but all theories are potentially falsifiable. Others take an interpretive or constructivist view, i.e. we are collectively responsible for defining what's "normal" and there can be multiple means of explaining the same thing. Qualitative research and critical theory accept the idea that there are multiple answers to a research question. Critical paradigms believe that what is "real" is shaped by powerful historical social forces [19, 20]. People who work in quantitative research can choose to conduct experimental methods, surveys, network analyses and other strategies [21]. People doing quantitative methods have to choose from narrative analyses, ethnographic research, or case studies, to name just a few approaches [22, 23]. All of these methods are directed towards different sorts of answers. Ideally, questions should come from a place of accommodation and commensurability [18] – meaning, that different approaches could complement each other, something adhered to by mixed methods scholars. If I wanted to know roughly how many teenagers are using Twitter exclusively through their cellphones, I can use quantitative research to learn the answer, via a method like a survey. But if I wanted to know *why* teenagers might prefer to use Twitter via their cellphones, then I would have to do more qualitative, interpretivist work, like an ethnography; and, neither answer should invalidate the other.

> La Forge: […] you can't always go with your gut either. It's a combination, Data. Right, I'll put it to you this way. All these feelings that get in the way of human judgment, that confuse the hell out of us, that make us second guess ourselves, well we need them. We need them to help us fill in the missing pieces because we almost never have all the facts. [24]

None of these nuances about how to do social science is unique to media studies, but since there is so much overlap between this research and other fields, scholars are aware of the importance of interdisciplinary bonds. When we see Starfleet scientists and engineers, they are usually not cryptic or arcane people, working on some incomprehensible project all by themselves. Often, La Forge accommodates their experiments and helps solving problems. One of the things stressed by the

command staff is the importance of working together as a team. As chief of engineering, La Forge is more than willing to do what needs to be done and work with others to accomplish their goals. Likewise, a media researcher might adopt the perspective of a statistician, or a historian, or a computer engineer, to understand how people are using social media, or the historical patterns of use, or the way their use is shaped by algorithms and code.

"Special Insight"

> La Forge: No question about it. She was bluffing, Worf.
> Worf: Bluffing is not one of Counselor Troi's strong suits. No, it would've been unwise to call. Yes, my hand was not strong enough.
> La Forge: You had jacks and eights, and she bluffed you with a pair of sixes.
> Worf: How did *you* know what I had?
> La Forge: Let's just say I had a special insight into the cards [points at his VISOR]. Maybe next time you should bring a deck that's not transparent to infrared light. Not to worry, Worf. I only peek after the hand is over. [25]

How does the VISOR change the dynamics of the officer's poker game? The *TNG* episode "Ethics" is clearly not the last time they play together, but perhaps Worf (Michael Dorn) does decide to change his choice of card decks. It certainly changes Worf's attitude, and how La Forge sees the game. He has a unique advantage that he can choose to exercise, so there are multiple ethical dilemmas that inform the episode.

We've already noted that the VISOR is no mere prosthesis, but rather an augmentation. It amplifies La Forge's vision in a way that makes other crew members weary. But anyone who's experienced what Langdon Winner calls "luddite epistemology" can attest to the power of technology [26]. When something breaks and you have to find an alternative, you become well aware of the importance that artifact has in your life. When your phone battery dies, or the power goes out, finding another way to communicate or retrieving candles from the back of the kitchen drawers can be a challenge. La Forge is blind without the VISOR, but we all have some form of technical prostheses. Our lives all depend on "technics" (the social interdependencies of people and technology). A simple trip to the grocery store depends on industrial agriculture and petroleum refining, among other things. Bruno Latour, a sociologist of science, refers to the artifacts involved in these processes as "nonhumans" [27], things that delegate the efforts of humans. In *Star Trek*, people depend on starships to take them where they want to go. We're all chained together in associations between humans and nonhumans.

Media studies doesn't just study the content of the media, but the "materiality" (i.e. the structural characteristics) of media and their social roles. Two extreme positions on how technology and media work in society are found in "technological determinism" and "social construction of technology" (SCOT), respectively. Technological determinism is a central theme of *Star Trek* – the idea that technological development always progresses in a linear way, that it has an autonomous nature, and that it directly causes social effects. One famous example is Lynn White's

claim that the invention of the stirrup for troops on horseback led to the rise of feudalism in Europe [27]. Winner is also known as a proponent of this kind of view. He argues that there is a "technological imperative" [26], where certain systems depend on a much larger chain of dependencies. The Klingons in Kirk's time depended on the moon Praxis as a key energy source – it's destruction in *Star Trek VI: The Undiscovered Country* (*ST:VI*) likely meant that they wouldn't have enough dilithium to power a war fleet that could counter the Federation. But technological determinism seems to have the same scary overtones as the cybernetic Borg, where people have no control over the system. They are instead assimilated into a hive mind and relationships dependent on machine control. Andrew Feenberg is another philosopher of technology whose thoughts on these ideas are worth reading [29]. The idea that people can subvert and overcome that sort of control by the media is a powerful emancipatory idea. When we talk about something like whether or not social media is democratizing, if TV makes us lazy, or if computers can make us smarter, we are using frames borrowed from technological determinism.

Social construction of technology takes a more human-centered approach. According to Bijker, both designers and users are responsible for the way technology emerges. Those who developed the bicycle didn't have an ideal design in mind. Rather, it gradually transformed into the sort of machine we are familiar with today. The bicycle itself is inert and has no power [30]. Between these viewpoints, Latour describes the relationships between humans and technology in the terms of an "actor network theory" (ANT) [31]. If we think of La Forge's friend Data as something not-quite-human (but certainly not just a machine), their relationship fits this model. La Forge's ongoing concerns over Data's possession of a chip that would grant him human emotions recognizes that all of them have some form of social power – the emotion chip will change Data's experience of the world, and both officers have a role in deciding what's the best choice.

There are powerful implications behind the idea that humans and "nonhumans" are both "actants" (Latour's term) or have some equal standing. They're connected in a network of relationships or "associations" driven by both physical or material things, and symbolic or negotiated meanings. Since media can be defined pretty loosely, it could be anything between humans, or between other actants, or as a nonhuman actant in its own right. It's not just the various forms of entertainment or the information pumped through the ship's computer, it's any form of mediation that alters the dynamics of the group, whether they're playing poker, exploring planets or scanning interstellar phenomena. This means that media is not always as distinct from us as we may think. We depend on our things in a way that archeologist Ian Hodder calls "entanglement" [32]. La Forge's VISOR would probably eventually fall apart without some routine maintenance, and he wouldn't be able to see without it. Likewise, La Forge depends on other crew members to help run the ship, and the ship depends on his VISOR to help him get the job done.

Conclusion

Riva/Harmony: What is that you're wearing?
La Forge: A VISOR. It interprets the electromagnetic spectrum and then carries the readings to my brain.
Riva/Harmony: Your VISOR serves the same function as my Chorus, which interprets my thoughts and translates them into sound?
La Forge: Yes.
Riva/Harmony: And don't you resent it?
La Forge: The VISOR or being blind?
Riva/Harmony: Either.
La Forge: No, since they're both part of me, and I really like who I am, there's no reason for me to resent either one.
Riva/Harmony: It's a blessing to understand we are special, each in his own way. [33]

In the *TNG* episode "Loud as a Whisper", the mediator Riva is deaf and mute. He communicates with others by way of a "Chorus" of three telepaths who speak for him, representing different aspects of his personality. Media works much in the way that Riva utilizes his Chorus. The way others interpret the messages we send can change depending on the medium we use. Sending a hand-written letter is usually interpreted as more intimate than a text message, for instance. Riva's feelings expressed above speak to the way that this sort of mediation is a part of us. It is deeply personal, in ways that researching communication helps to articulate.

The *TNG* episode "Interface" also gives us another good example. La Forge uses his neural implants to remotely control a probe in a rescue/salvage operation of a starship stranded deep in a gas giant. Increasing the input gain on the probe puts a strain on his nervous system. At high tolerance he receives better sensory feedback, but he also puts himself at a risk. In this sense, when the probe is damaged, La Forge will suffer injuries [34]. This is similar to a concept called "embodiment" where the body and the media are connected and related. McLuhan's idea of the media extending our senses is still relevant when we think about wearable technology and mobile media, such as the cellphones or tablets we carry with us through the day [2]. Some of these perspectives fit into work on "posthumanism" [35], which takes media studies into both the present and imagined futures of humans and technology.

Star Trek is an exploration of humanity and strengths of character demanded by various challenging scenarios. Meanwhile, the tools and technology seems to hum in the background. Handheld computers like the tricorder or the Personal Access Display Devices (PADDs) were once novel imaginations, but they now seem as mundane as an iPad. Starfleet officers seem to have grown accustomed to their media (though Reginald Barclay does struggle with an addiction to the escapism offered by the the holodeck). As our own media technology becomes more ubiquitous, it's more obvious than ever how media and communication is a powerful part of human culture [36]. Understanding the role of technology in culture, how different media change the nature of the messages we send, or the way people and culture responds to changes in communication is the role of this discipline. The different questions we ask require all sorts of interdisciplinary different insights and approaches. But maybe one of the most important insights we can take away from

media studies is the way it makes our channels of communication strange, or highlights the role they play in society. Everything from the mundane, like a pair of eyeglasses, to the complicated processes that allow us to send an email, and even language itself, stands between us and others. They change how we see and relate to the world. La Forge's VISOR enables him to experience the world in a unique way. This is not just the promise of technology and media. It's also what media studies and research can do for us. It can open up new perspectives and insights into what we might otherwise take for granted.

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"Logic is the beginning of wisdom … not the end": Using *Star Trek* to Teach Scientific Thinking

John N. A. Brown

Abstract

To paraphrase Batman: "[humans] are a superstitious and cowardly lot". We cling to our preconceptions against all evidence, literally unable to see the unexpected forest when we find that our field of view is crowded with an unanticipated number of trees. Our preconceptions and other cognitive biases weaken our individual ability to perceive the world around us. Telling fact from fantasy requires cooperation and formal, unintuitive thought. Scientific thinking may be the single greatest intellectual tool ever developed. Contrary to popular belief, it is not a way of proving things true, but a way of proving them false. It is not the work of a singular intellect, but a social activity. It is a method of altering the inherent iterative cycles of bias reinforcement and leaps of faith that we consider intuitive thinking, so that we explicitly define the weaknesses in our own ideas and count on others to help us find the flaws we've missed. But how does one teach this unintuitive style of thinking? How do we keep our students from exchanging one set of preconceptions and cognitive shortcuts for another? Personally, I use mental models with which they are already familiar. Personally, I use *Star Trek*.

Keywords

Anthropology-Based Computing (ABC) · Cognitive biases · Human-Computer Interaction (HCI) · Research methods · Scientific thinking · *Star Trek*

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Editors' Log: Chapter 15

The decision-making process common to the original *Star Trek* series, and to most of those that followed, was deliberately confrontational. The senior officer asks for opinions, and then a debate (or argument) ensues. John NA Brown is a specialist in how humans interact with one another and with their simple or complex tools. He asserts that these exchanges reflect the processes required in scientific thinking – a form of teamwork that might be the single greatest gift that the human race can offer to its own future. (**Eds.**)

Star Trek: The Motion Picture **(1979)**
Kirk: *Opinion, Mister Spock?*
Spock: *Recommend we proceed, Captain.*
Kirk: *Mister Decker?*
Decker: *I advise caution, Captain, we can't withstand another attack.*
Kirk: *That thing is twenty hours away from Earth. We know nothing about it yet.*
Decker: *That's precisely the point. We don't know what it will do. Moving into that Cloud, at this time, is an unwarranted gamble.*
Kirk: *How do you define 'unwarranted'?*
Decker: *You asked my opinion, sir.*
Kirk: *Viewer, standard ahead. ...Navigator, maintain course. Helmsman, ...steady as she goes.*

(continued)

***Star Trek: The Next Generation*, 01×06, "Where No One Has Gone Before" (1987)**

Picard: *Comment is invited. Counsellor?*

Troi: *He's convinced he's right. I have no doubt of that.*

Worf: *Captain, can you allow a man who has made one mistake back into a position where he may make another?*

La Forge: *Captain, what are our options really? I mean, if this guy can't get us back, who will?*

Data: *Captain, we're here. Why not avail ourselves of this opportunity for study? There is a giant protostar here in the process of forming. No other vessel has been out this far.*

Picard: *Spoken like a true Starfleet graduate. It is tempting, eh, Number One?*

Riker: *Aye, sir, it is. But as they say, sir, you're the Captain.*

Part of the fundamental story-telling structure of *Star Trek* is to show extremely capable people solving a problem by working together. The stories depend on the concept that, even though each individual crew member is an expert in their own right, they succeed not by reacting impulsively, but through cooperation. Even when they come from different backgrounds, professions, and fields of study, even when their entire perspective is contradictory, their heterogeneous perspectives help them find new solutions.[1]

This is reflected in the Vulcan philosophy of Infinite Diversity through Infinite Combinations [1]. This is also reflected in the formal process of scientific thinking, which teaches us that ideas and insights can be intuited, but that beliefs must be tested and confirmed by others in order to be valid. This sounds very formal, but it can be expressed more simply. The great physicist Richard Feynman said: "Science is the belief in the ignorance of experts" [2, p. 313–320]. This doubt of the knowledge of others must begin with a belief that we, our individual selves, are ignorant, too.

> This is not a new idea; this is the idea of the age of reason. This is the philosophy that guided the men who made the democracy that we live under. The idea that no one really knew how to run a government led to the idea that we should arrange a system by which new ideas could be developed, tried out, tossed out, more new ideas brought in; a trial and error system. This method was a result of the fact that science was already showing itself to be a successful venture at the end of the 18th century. Even then it was clear to socially minded people that the openness of the possibilities was an opportunity, and that doubt and discussion were essential to progress into the unknown. If we want to solve a problem that we have never solved before, we must leave the door to the unknown ajar. [3, p. 15]

[1] This observation stands for the entire corpus of *Star Trek* (television, films, animation, and novels, until the franchise was rebooted as a film series in 2009. Prior to that, each adventure would present a complex social issue through simplified allegorical scenarios, and resolution would be achieved through the emotional and intellectual struggles of a team of well-trained experts at the peak of their careers. The first two films of the reboot reversed this pattern, telling unnecessarily complex stories built around a series of simple problems, resolved through the physical actions of sophomoric individuals who succeed through a mixture of individual exceptionalism and luck.

The reason we must learn to doubt ourselves is that we are not actually very good at observing the world or even, contrary to our species-centric vanity, at thinking rationally about it. In fact, what we are very good at is jumping to conclusions, pretending we know more than we really do, and trying to convince ourselves that we were right all along. Let's take a look at just how and why our minds work that way.

Spock: "We have here an unusual opportunity to appraise the human mind..."
The Enemy Within

The process of thinking is not straightforward. A lot of my teaching and most of my research is based on this idea, and I'd like to take a moment to explain it to you before we go on.

Part of your mind, right now, is interpreting detected patterns of light reflected from the objects around you, and the movement of air in and out of your body, and the balanced interaction between your muscles that is keeping you sitting upright. This information is very complex, but detecting and interpreting it remains on the periphery of our attention – that is – we don't focus on it at all under normal circumstances. You might be thinking of those processes now that I've brought them to your attention but, since they are not the focus of this little discussion, I will ask you to try to go back to ignoring for them for the time being.

Another part of your mind is worried right now. The worry might be expressing itself as gentle, cloying concern, or it might be foot-tapping nervousness, or even outright fear. It could also be taking the form of seething anger or nearly overwhelming frustration, but it is worry. As Spider Robinson has often written, "anger is always fear in disguise" [4]. In some schools of meditation this is referred to as the monkey brain – a primitive and distracting chatter of anxiety that keeps us from thinking clearly. Most of the time, this pervasive, unconscious worrying is much harder to ignore than balance or breathing or the objects in the background of your line of sight but – and this is important – most of the time we can ignore some of the fear and some of the time we can ignore most of the fear. Do you feel emotional now? Has your reading been interrupted by frustration or by thoughts of other things that have been bothering you? Can you ignore it and read on?

If we can get through the thick forest of sensory noise, and past the overly-emotional monkey that chatters incessantly there in the dark, we can reach the part of our mind that is capable of turning observed letters into unanticipated words and phrases, and of turning those phrases into meaningful ideas. Deep in that forest, rising above sensory trees and emotional monkeys, there stands an ivory tower. The part of your mind that is logical sits at a small window high in that tower with head in the clouds, and thinks rationally about the meager ration of sensory data it receives. That is the part of your mind that is reading this paper – if you've managed to maintain your focus.

And that is a key point.

McCoy: "I'm not talking about rationality."
Spock: "You might be wise to start."

The Galileo Seven

It is harder to use the rational part of your brain. It literally takes more energy to reflect clearly and calmly than it does to react with emotion. Reflection is also slower than reaction and both are slower and use more energy than purely reflexive behaviour – like the breathing and balance and sight that have already been mentioned.

The idea that we each have multiple minds in simultaneous use is not original with me [5]. Malcolm Gladwell believes that we have two processing systems that work at different speeds [6], as do Tversky and Kahneman [7]. Even the idea that we have three processing systems has been around for a long time, with key examples found in the legacies of Plato and Aristotle [8], and in the theories of Freud [9] and of Jung [10]. The idea that the evolution of these separate types of mind can be related to the evolution of specific parts of the brain can be traced to nineteenth Century French anthropologist Broca who proposed specialization of brain regions [11]. His ideological descendant in the twentieth Century, Paul MacLean, is often credited with establishing the first model of the triune brain [12]. I have written about this myself [13], but I strongly recommend Carl Sagan's "The Dragons of Eden" [14] for any reader who wants a beautifully-written introduction to the idea – and to many other ideas, too.

Basically, brain structure reflects the evolutionary order in which these different types of interactive processes developed. Doesn't it make sense to think that the earliest systems, the ones that run constantly, would operate at a level of low energy consumption and with a low demand for attention? Imagine two ancestors we might have had a few tens of millions of years ago; one who had to think about each breath and each stage of digestion, and one who could use that same attentional processing power to look out for predators. We can easily imagine which one would be more likely to have lived to puberty, and so contributed to our gene pool. I propose that the order in which we developed our three different systems is responsible for the ranking of energy consumption and effort, in inverse relation to ease and speed.

Now, if you'll allow me, I'll express the idea again in different words. I hope that they are not too offensive. All of the genes we carry were filtered over millions of years of evolution, probably by the process of natural selection. In order to pass on any genes at all, the individual at each stage had to be able to survive. Survival can be seen at two levels. The more fundamental one is literally the biochemical processes of metabolic survival that we must be able to perform from birth: breathing, digesting, etc... As the ancient Greeks pointed out, even the plants can do that [8].

The next level of survival is the development and adaptation of learned behaviours in response to our environment. One who does not learn to do this well will not advance beyond infancy and the need for continual care, and so will not be likely to contribute to the genetic material of the next generation. As MacLean pointed out, primitive man had to be able to do this... though, as far as that goes, so

did earlier primates, birds, lizards, and fish. Interestingly, the active nature of this learning – and the perceived genetic value of it – may well be responsible for mating rituals and displays of attractiveness among all of those species. This can be witnessed to hilarious effect in nature, and on YouTube. In my personal opinion, similar attempts by our own species tend to be even funnier.

From an evolutionary perspective, intellectual capacity is the least important of the processing systems because it doesn't get to come into play unless the other two have already been successful. I am certain that I am not the first *Star Trek* fan to wish that this were not the case, but that does not change the fact that being able to quote Harlan Ellison, David Gerrold, or Dorothy Fontana is simply not as important – from this perspective – as being able to walk attractively.

Spock: "I survive it because my intelligence wins out over both, makes them live together."

The Enemy Within

I want to stress that the relationships between speed, effort and energy consumption that is entrenched in this evolutionary order is not the most important aspect of my theory. In fact, that can already be derived from the earlier work cited above. The important part of my theory is totally contrary to almost all of the theories mentioned earlier. I believe that only Freud avoided the hubris that made the others assume that our thoughtful selves are in control. In fact, I theorize that the others all got the order of control completely backwards, and I propose that the evidence for this is found all around us. We do not exert conscious control over our unconscious – our unconscious is in constant control of the vast majority of our behaviours. It cedes control to our conscious and deliberate and rational thinking only under rare circumstances, and only for limited amounts of time. In the same way, our reflexes take precedence and control over our emotions.

We can force ourselves to pay conscious attention to things for a little while, but only some things, and only for a little while. Otherwise, it is either our reflexive system or our emotional, reactive system that responds to most of the conditions and situations we encounter. Professor Einstein wrote a short memorial for his friend Maria Sklodowska Curie, expressing his great admiration for her as a person and as a scientist. Here he praises her ability to maintain conscious focus:

> The greatest scientific deed of her life—proving the existence of radioactive elements and isolating them—owes its accomplishment not merely to bold intuition but to a devotion and tenacity in execution under the most extreme hardships imaginable, such as the history of experimental science has not often witnessed. [15]

Yes, he says that tenacity such as hers is rare, but he holds it up as the ideal. The notion that we must struggle to maintain conscious focus challenges our claim to be rational, thinking creatures. I've suggested elsewhere that we should change the name of our species to something a little more accurate – not "Homo sapiens sapiens" (the hominid who is so wise you have to say so twice), but "Homo sapiens reagens" (the hominid who has wisdom but reacts) [16].

Does the idea that humans don't think well amuse you? Does it upset you? Do you dismiss it out of hand? In either case you are reacting emotionally to an idea that is challenging your mental model of yourself. Why the emotion? Because that happens faster than the conscious thought, which is still being delayed because it is reading these words and trying to understand the argument. The emotional reaction started long before you read this last word.

Now, if you can accept this idea – at least as an idea to think about, not necessarily as one to believe – then I want to take it a little further. Now that you're thinking about the fact that we might not be very good at thinking, it's time to talk about how bad we are at sensing the world around us.

Kirk: "Sometimes a feeling is all we humans have to go on."
A Taste of Armageddon

With apologies to Bill Maher, it is a simple fact that we do not think about the world around us in real time. Our reflexive and reactive systems respond to the real world in thousandths or hundredths of a second. Think about that. Did you notice how long it took you to think about that? Our rational system is a thousand times slower than our reflexes, and a hundred times slower than our first impulsive reaction!

The fact that we are not consciously aware of that suggests an idea that is measurably demonstrated but a little hard to believe. The rational and intellectual part of our thoughts is constantly trying to catch up with what we have already done, and has created an elaborate and ongoing illusion of deliberate action to justify most of our behaviour.

This is the practical side of Aristotle's "man in the cave" [17] and Descartes' "cogito ergo sum" [18]. To return to the illustrative model of the tower in the forest, the thinker in the ivory tower doesn't really know the difference between thoughts and dreams – and has no ability to tell what is accurately sensed or reported, and what is a mistake or a deliberate lie because he is too far removed from reality. What's missing from Aristotle and Descartes is an empirical understanding of just how far from reality we are. It is a measurable distance, and you have probably already measured it many times without realizing it. Let's take a look at one example.

Do you tie your own shoelaces? If so, stop reading for a moment, and try to imagine every single move you make with your fingers in order to turn the two ends of string into a sturdy knot. Please be precise and please don't skip over any steps. Once you have imagined each step, please continue at the next paragraph.

You're back? Now, if you did try that thought experiment, then there are two likely possibilities for how things just went. You either believe that you imagined each detailed step, or you realized that – off the top of your head – you don't know what they are. Most of you reading this are likely to believe that you have easily remembered each step... but have you? Did you start with your left hand or with your right? Which finger did you use to form the first loop? Finishing the task, which fingertip pinched against the tip of your thumb as you tightened the knot?

Still think you went through each step in detail? Maybe you did. To really find out, write out each step as a point form list, then give it to a friend and ask them to do exactly what is written. Hilarity will likely ensue.

You see, tying your laces involves repeating a pattern you have learned to do unthinkingly.

That kind of unthinking pattern of coordinated reflexes is happening all of the time. It's fundamental to how you walk and run, to how you manage to successfully reach for one particular thing or step around another. Unconscious pattern following is also fundamental to many types of social interactions – have you ever reached out to shake the hand of someone who couldn't, or answered an expected question instead of the unexpected one that was actually being asked?

That's an interesting part of your own behaviour that you may or may never before have tried to explicitly understand. It's a strange idea, that we react too slowly to the world around us. How we deal with it is even stranger.

We rely constantly on mental maps, impressions and beliefs about the world around us. We react quickly and emotionally to new information at speeds too fast for our rational minds. We are so immersed in our personally-generated virtual reality that we are slow to accept when it is inaccurate. What's more, we often refuse to believe that we are wrong, or that we reacted incorrectly, sometimes building elaborate scaffolds of fantasy in an attempt to fortify an illusion that can no longer stand on its own.

A cynic might suggest that this is how superstition could become religion.

Spock: "Logic informed me that, under the circumstances, the only possible action would have to be one of desperation. Logical decision, logically arrived at."

Kirk: "Aha, ha ha. I see. You mean you reasoned that it was time for an emotional outburst."

The Galileo Seven

Many have suggested that our memories are often faulty [19]. Witnesses often have conflicting memories of events that they experienced together [20]. It may be that at least some of that conflict is actually due to the fact that each witness was working from a different mental model of what was going on. It could be that they are remembering correctly, but that they experienced different events.

Now that seems ridiculous, right? I recently had a conversation on this topic with a couple in a quiet restaurant in Lisbon. One of the two partners, an engineer by trade, resolutely refused to believe that his perception could be anything but correct because he was observing carefully and thinking deeply. The sad truth is that he was doing neither of those things. That is not meant to be a personal or professional insult, simply an observation of the fact that he is human.

He was convinced that his eyes were dutiful cameras, observing and recording everything around him, and that the microphones that serve as his ears were working just as well. Both systems were feeding constant streams of data into the central processing system that was humming away inside him, feeding a superbly rational

cognition engine so that it could maintain a perfectly accurate understanding of the world around him.

Well, the simple truth is that his brain does not work that way and neither do his senses. No offense is intended. My brain and sense don't work that way either, and neither do yours.

I've mentioned that we live inside a self-generated, virtual reality. Please allow me to explain why these virtual realities are fictional.

Remember a few paragraphs back, when I made a point of saying how our senses work much faster than our cognition? Well, what I left out then was that they make a big sacrifice in order to function as quickly as possible. Our senses take small, fast samples and, as a result, they are terribly, terribly inaccurate.

Consider your eyes. You do not see in a constant stream of vision. Peter-Mark Roget, the polymath genius who invented the thesaurus, the sliderule, and more [21] published a brilliant and often mis-referenced paper in 1825 on the topic of the speed at which our eyes see, and the illusion of constant vision [22]. His observation led to the beginnings of animation. The practice of animation led in turn to an improved understanding of the degrees of change from one image to the next that would best maintain the illusion [23]. That led to the development of new technologies for making images that were similar enough, and for presenting them on a medium that could be displayed in rapid and consistent sequence. In this way, hand-made animation led to movies, films, videos, and animated GIFs [24].

Kirk: "No blah, blah, blah!"

Miri

So, our eyes don't see moving images, they just see a series of still images and interpret the right kind of change to mean motion. This means that our eyes are constantly scanning for changes that are recognizable as motion. In fact, if you look at someone's eyes while they're going on about some everyday task, you'll observe that they are in almost constant motion. The almost incessant tiny motions are called saccades, and they are pretty surprising the first time you notice them. What's more, they're also undetectable to the person doing them. How can that be? The answer is actually awesome. Before we get to it, let me ask you to do a little experiment with a mirror. This test was originally designed for people with two working eyes [24]. If you are fully- or partially-blind, and would like an example that is not vision-based, please write me directly. I would be happy to provide one based on hearing. If your vision and hearing are both limited, I would be happy to provide an example based on proprioception or touch. For now, let me continue with the simplest version, the one that will work for most readers.

Face a mirror and look at one of your eyes. After a moment, look at the other. Repeat three or four times. Now, repeat the process again but, as you do, pay attention to your eyes. Did you see them move? Try again and pay close attention. Can you feel them moving back and forth?

You will not see your eyes move. You cannot. When your eyes are moving your brain stops processing vision because there are too many changes to process quickly.

In fact, you are only seeing about 15% of the time you think you are [25]. More about that in a little while.

We think we are perceiving the world, but in truth we are perceiving small pieces of it and fitting them into a mental model.

This is why witnesses report conflicting experiences – they each actually saw different subsets of the real visual data, and they each actually fit them in to their own individually-fictitious mental models. They literally experienced different things at the same time and place. Give them time apart and the differences in their memories may broaden as they develop elaborate details supporting their individual understanding of the experience.

On the other hand, if you give them the chance to build these elaborate scaffoldings together, a sadly-predictable result is achieved. The individuals come to believe that they also witnessed fictional things invented by the others. This is even true about things that could only have been seen from the perspective of others. In this way, shared fictions are much less accurate than individual self-deception of the sort described above.

This is why scientific thinking requires independent observation and interpretation, even while it specifically requires that all observations and interpretations should be doubted and compared with the finished work of others.

We can only build dependable mental models if we are willing to challenge them with new data. To do this we elicit expert opinion from others – or as expert as possible – even though we might, on reflection, reject it.

This is why scientific thinking is so important, it teaches us to assume we are not understanding the world around us, and that we need additional people's opinions about the accuracy of what we think we have seen and how we have interpreted it, and the methods we have used for both.

Spock: "Has it occurred to you that there's a certain... inefficiency in constantly questioning me on things you've already made up your mind about?"
Kirk: "It gives me emotional security."

The Corbomite Maneuver

We want to trust our impressions and impulses, our quick reactive responses to the world around us. This leaves us with two choices. The first is to train ourselves so that our fast reactions are suitable to our situations. This is the case of practical experts in any field, from Judo players and skateboarders who have learned how to fall without getting hurt, to astronauts who have learned how to deal with emergencies even when deprived of sight or when in pain.

The second is to make false assumptions with great certainty, and count on our faith to pull us through – this is superstition and its younger sibling religion.

Earlier, I implied that Batman's foundational belief about criminals [26] could also be applied to humans in general; that we are "superstitious and cowardly". This is not a random insult, but an assessment of how we may think. We cling to our preconceptions against all evidence, literally unable to see the unexpected forest when we find that our field of view is crowded with an unanticipated number of trees. Our preconceptions and other cognitive biases weaken our individual ability

to perceive the world around us. Telling fact from fantasy requires cooperation and formal, unintuitive thought. Scientific thinking is not the simple, intuitive work of a singular intellect, but a social activity. It is a method of altering the inherent iterative cycles of bias reinforcement and leaps of faith that we consider intuitive thinking, so that we explicitly define the weaknesses in our own ideas and count on others to help us find the flaws we've missed. A thousand years before René Descartes declared that our thoughts prove we exist [27], Augustine wrote "ergo sum si fallor" or "therefore I am because I err" [28].

Scientific thinking is about realizing that we each have these logical fallacies, and misperceptions, and inaccurate self-calibration, and so must try to work around those individual weaknesses and collaborate in order to improve the quality of our thinking.

> It is our responsibility as scientists, knowing the great progress and great value of a satisfactory philosophy of ignorance, the great progress that is the fruit of freedom of thought, to proclaim the value of this freedom, to teach how doubt is not to be feared but welcomed and discussed, and to demand this freedom as our duty to all coming generations. [29, p. 15]

In that way, scientific thinking is our gift to the future. The gift is not what we have learned, but that we have learned how to help each other learn. We have learned that knowledge advances in the freedom to doubt without shame. We have learned to see doubt as a sign of knowledge, and certainty as a sign of ignorance.

A scientific thinker separates their personal perception of their own self-worth from their faith in what they think they know. They do this by assuming they are wrong and asking others to check their work – not to prove the ideas right, but to try and prove them wrong. The knowledge that we are ignorant prepares us to receive new knowledge – not in a superficial way – but deeply.

This enables us to replace old mental models with new ones, again and again, avoiding the dogma of faith and certainty with the optimistic intent to keep learning. This is how the thinking of the many can be greater than the thinking of the one, so long as it is directed at modestly and methodically challenging information rather than attacking or supporting it blindly.

And that is the purpose of teamwork in *Star Trek*: Using many minds to improve ideas. In this way they show us how to seek out new facts and new information; to boldly disprove ideas that everyone has believed before.

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Appendices

Appendix 1

Star Trek: The Original Series (Originally known simply as *Star Trek*)
Season 1, 1966–1967 to Season 3, 1968–1969

Season#	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	1	"The Man Trap"	1513.1	Marc Daniels	George Clayton Johnson	September 8, 1966
1	2	"Charlie X"	1533.6	Lawrence Dobkin	Story: Gene Roddenberry, Teleplay: D. C. Fontana	September 15, 1966
1	3	"Where No Man Has Gone Before"	1312.4	James Goldstone	Samuel A. Peeples	September 22, 1966
1	4	"The Naked Time"	1704.2	Marc Daniels	John D. F. Black	September 29, 1966
1	5	"The Enemy Within"	1672.1	Leo Penn	Richard Matheson	October 6, 1966
1	6	"Mudd's Women"	1329.8	Harvey Hart	Story: Gene Roddenberry, Teleplay: Stephen Kandel	October 13, 1966
1	7	"What Are Little Girls Made Of?"	2712.4	James Goldstone	Robert Bloch	October 20, 1966
1	8	"Miri"	2713.5	Vincent McEveety	Adrian Spies	October 27, 1966
1	9	"Dagger of the Mind"	2715.1	Vincent McEveety	S. Bar-David	November 3, 1966
1	10	"The Corbomite Maneuver"	1512.2	Joseph Sargent	Jerry Sohl	November 10, 1966
1	11	"The Menagerie Part 1"	3012.4	Marc Daniels	Gene Roddenberry	November 17, 1966
1	12	"The Menagerie Part 2"	3013.1	Robert Butler	Gene Roddenberry	November 24, 1966

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S. Rabitsch et al. (eds.), *Set Phasers to Teach!*,
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Season#	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	13	"The Conscience of the King"	2817.6	Gerd Oswald	Barry Trivers	December 8, 1966
1	14	"Balance of Terror"	1709.2	Vincent McEveety	Paul Schneider	December 15, 1966
1	15	"Shore Leave"	3025.3	Robert Sparr	Theodore Sturgeon	December 29, 1966
1	16	"The Galileo Seven"	2821.5	Robert Gist	Story: Oliver Crawford, Teleplay: Oliver Crawford and S. Bar-David	January 5, 1967
1	17	"The Squire of Gothos"	2124.5	Don McDougall	Paul Schneider	January 12, 1967
1	18	"Arena"	3045.6	Joseph Pevney	Story: Fredric Brown, Teleplay: Gene L. Coon	January 19, 1967
1	19	"Tomorrow Is Yesterday"	3113.2	Michael O'Herlihy	D. C. Fontana	January 26, 1967
1	20	"Court Martial"	2947.3	Marc Daniels	Story: Don M. Mankiewicz, Teleplay: Don M. Mankiewicz and Steven W. Carabatsos	February 2, 1967
1	21	"The Return of the Archons"	3156.2	Joseph Pevney	Story: Gene Roddenberry, Teleplay: Boris Sobelman	February 9, 1967
1	22	"Space Seed"	3141.9	Marc Daniels	Story: Carey Wilber, Teleplay: Gene L. Coon and Carey Wilber	February 16, 1967
1	23	"A Taste of Armageddon"	3192.1	Joseph Pevney	Story: Robert Hamner, Teleplay: Robert Hamner and Gene L. Coon	February 23, 1967
1	24	"This Side of Paradise"	3417.3–3417.7	Ralph Senensky	Story: Nathan Butler[1] and D. C. Fontana, Teleplay: D. C. Fontana	March 2, 1967
1	25	"The Devil in the Dark"	3196.1	Joseph Pevney	Gene L. Coon	March 9, 1967
1	26	"Errand of Mercy"	3198.4	John Newland	Gene L. Coon	March 23, 1967
1	27	"The Alternative Factor"	3087.6	Gerd Oswald	Don Ingalls	March 30, 1967
1	28	"The City on the Edge of Forever"	3134.0	Joseph Pevney	Harlan Ellison	April 6, 1967

(continued)

Season#	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	29	"Operation: Annihilate!"	3287.2	Herschel Daugherty	Steven W. Carabatsos	April 13, 1967
2	1	"Amok Time"	3372.7	Joseph Pevney	Theodore Sturgeon	September 15, 1967
2	2	"Who Mourns for Adonais?"	3468.1	Marc Daniels	Gilbert Ralston	September 22, 1967
2	3	"The Changeling"	3541.9	Marc Daniels	John Meredyth Lucas	September 29, 1967
2	4	"Mirror, Mirror"	Unknown	Marc Daniels	Jerome Bixby	October 6, 1967
2	5	"The Apple"	3715.3	Joseph Pevney	Story: Max Ehrlich, Teleplay: Max Ehrlich and Gene L. Coon	October 13, 1967
2	6	"The Doomsday Machine"	4202.9	Marc Daniels	Norman Spinrad	October 20, 1967
2	7	"Catspaw"	3018.2	Joseph Pevney	Robert Bloch	October 27, 1967
2	8	"I, Mudd"	4513.3	Marc Daniels	Stephen Kandel	November 3, 1967
2	9	"Metamorphosis"	3219.4	Ralph Senensky	Gene L. Coon	November 10, 1967
2	10	"Journey to Babel"	3842.3	Joseph Pevney	D. C. Fontana	November 17, 1967
2	11	"Friday's Child"	3497.2	Joseph Pevney	D. C. Fontana	December 1, 1967
2	12	"The Deadly Years"	3478.2	Joseph Pevney	David P. Harmon	December 8, 1967
2	13	"Obsession"	3619.2	Ralph Senensky	Art Wallace	December 15, 1967
2	14	"Wolf in the Fold"	3614.9	Joseph Pevney	Robert Bloch	December 22, 1967
2	15	"The Trouble with Tribbles"	4523.3	Joseph Pevney	David Gerrold	December 29, 1967
2	16	"The Gamesters of Triskelion"	3211.8	Gene Nelson	Margaret Armen	January 5, 1968
2	17	"A Piece of the Action"	4598.0	James Komack	Story: David P. Harmon, Teleplay: David P. Harmon and Gene L. Coon	January 12, 1968
2	18	"The Immunity Syndrome"	4307.1	Joseph Pevney	Robert Sabaroff	January 19, 1968
2	19	"A Private Little War"	4211.4	Marc Daniels	Story: Jud Crucis[2], Teleplay: Gene Roddenberry	February 2, 1968
2	20	"Return to Tomorrow"	4768.3	Ralph Senensky	John Kingsbridge[3]	February 9, 1968

(continued)

Season#	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
2	21	"Patterns of Force"	2534.0	Vincent McEveety	John Meredyth Lucas	February 16, 1968
2	22	"By Any Other Name"	4657.5	Marc Daniels	Story: Jerome Bixby, Teleplay: D. C. Fontana and Jerome Bixby	February 23, 1968
2	23	"The Omega Glory"	Unknown	Vincent McEveety	Gene Roddenberry	March 1, 1968
2	24	"The Ultimate Computer"	4729.4	John Meredyth Lucas	Story: Laurence N. Wolfe, Teleplay: D. C. Fontana	March 8, 1968
2	25	"Bread and Circuses"	4040.7	Ralph Senensky	Gene Roddenberry and Gene L. Coon	March 15, 1968
2	26	"Assignment: Earth"	Unknown	Marc Daniels	Story: Gene Roddenberry and Art Wallace, Teleplay: Art Wallace	March 29, 1968
3	1	"Spock's Brain"	5431.4	Marc Daniels	Lee Cronin[4]	September 20, 1968
3	2	"The Enterprise Incident"	5027.3	John Meredyth Lucas	D. C. Fontana	September 27, 1968
3	3	"The Paradise Syndrome"	4842.6	Jud Taylor	Margaret Armen	October 4, 1968
3	4	"And the Children Shall Lead"	5029.5	Marvin Chomsky	Edward J. Lakso	October 11, 1968
3	5	"Is There in Truth No Beauty?"	5630.7	Ralph Senensky	Jean Lisette Aroeste	October 18, 1968
3	6	"Spectre of the Gun"	4385.3	Vincent McEveety	Lee Cronin[4]	October 25, 1968
3	7	"Day of the Dove"	5630.3	Marvin Chomsky	Jerome Bixby	November 1, 1968
3	8	"For the World Is Hollow and I Have Touched the Sky"	5476.3	Tony Leader	Rik Vollaerts	November 8, 1968
3	9	"The Tholian Web"	5693.2	Herb Wallerstein	Judy Burns and Chet Richards	November 15, 1968
3	10	"Plato's Stepchildren"	5784.2	David Alexander	Meyer Dolinsky	November 22, 1968
3	11	"Wink of an Eye"	5710.5	Jud Taylor	Story: Lee Cronin[4], Teleplay: Arthur Heinemann	November 29, 1968
3	12	"The Empath"	5121.5	John Erman	Joyce Muskat	December 6, 1968

(continued)

Season#	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
3	13	"Elaan of Troyius"	4372.5	John Meredyth Lucas	John Meredyth Lucas	December 20, 1968
3	14	"Whom Gods Destroy"	5718.3	Herb Wallerstein	Story: Lee Erwin and Jerry Sohl, Teleplay: Lee Erwin	January 3, 1969
3	15	"Let That Be Your Last Battlefield"	5730.2	Jud Taylor	Story: Lee Cronin[4], Teleplay: Oliver Crawford	January 10, 1969
3	16	"The Mark of Gideon"	5423.4	Jud Taylor	George F. Slavin and Stanley Adams	January 17, 1969
3	17	"That Which Survives"	Unknown	Herb Wallerstein	Story: Michael Richards[5], Teleplay: John Meredyth Lucas	January 24, 1969
3	18	"The Lights of Zetar"	5725.3	Herb Kenwith	Jeremy Tarcher and Shari Lewis	January 31, 1969
3	19	"Requiem for Methuselah"	5843.7	Murray Golden	Jerome Bixby	February 14, 1969
3	20	"The Way to Eden"	5832.3	David Alexander	Story: Michael Richards[5] and Arthur Heinemann, Teleplay: Arthur Heinemann	February 21, 1969
3	21	"The Cloud Minders"	5818.4	Jud Taylor	Story: David Gerrold and Oliver Crawford, Teleplay: Margaret Armen	February 28, 1969
3	22	"The Savage Curtain"	5906.4	Herschel Daugherty	Story: Gene Roddenberry, Teleplay: Arthur Heinemann and Gene Roddenberry	March 7, 1969
3	23	"All Our Yesterdays"	5943.7	Marvin Chomsky	Jean Lisette Aroeste	March 14, 1969
3	24	"Turnabout Intruder"	5928.5	Herb Wallerstein	Story: Gene Roddenberry, Teleplay: Arthur Singer	June 3, 1969

[a]This table lists writers as credited on the original air date

[1] Nathan Butler is a pseudonym used by Jerry Sohl due to overt changes to his original story and screenplay

[2] Jud Crucis is a pseudonym chosen by Don Ingalls to reflect his unhappiness with overt changes to his story

[3] John Kingsbridge is the pen name for John T. Dugan

[4] Lee Cronin is a pseudonym used by Gene L. Coon, after he stepped down as producer

[5] Michael Richards is a pseudonym used by D. C. Fontana when unhappy with changes to her writing

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Appendix 2

Star Trek: The Animated Series (Originally known simply as *Star Trek*) Season 1, 1973–1974 to Season 2, 1974

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	1	"Beyond the Farthest Star"	5221.3	Hal Sutherland	Samuel A. Peeples	September 8, 1973
1	2	"Yesteryear"	5373.4	Hal Sutherland	D. C. Fontana	September 15, 1973
1	3	"One of Our Planets Is Missing"	5371.3	Hal Sutherland	Marc Daniels	September 22, 1973
1	4	"The Lorelei Signal"	5483.7	Hal Sutherland	Margaret Armen	September 29, 1973
1	5	"More Tribbles, More Troubles"	5392.4	Hal Sutherland	David Gerrold	October 6, 1973
1	6	"The Survivor"	5143.3	Hal Sutherland	James Schmerer	October 13, 1973
1	7	"The Infinite Vulcan"	5554.4	Hal Sutherland	Walter Koenig	October 20, 1973
1	8	"The Magicks of Megas-tu"	1254.4	Hal Sutherland	Larry Brody	October 27, 1973
1	9	"Once Upon a Planet"	5591.2	Hal Sutherland	Chuck Menville and Len Janson	November 3, 1973
1	10	"Mudd's Passion"	4978.5	Hal Sutherland	Stephen Kandel	November 10, 1973
1	11	"The Terratin Incident"	5577.3	Hal Sutherland	Paul Schneider	November 17, 1973
1	12	"The Time Trap"	5267.2	Hal Sutherland	Joyce Perry	November 24, 1973
1	13	"The Ambergris Element"	5499.9	Hal Sutherland	Margaret Armen	December 1, 1973
1	14	"The Slaver Weapon"	4187.3	Hal Sutherland	Larry Niven (adapted from his own story "The Soft Weapon")	December 15, 1973

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	15	"The Eye of the Beholder"	5501.2	Hal Sutherland	David P. Harmon	January 5, 1974
1	16	"The Jihad"	5683.1	Hal Sutherland	Stephen Kandel	January 12, 197
2	1	"The Pirates of Orion"	6334.1	Bill Reed	Howard Weinstein	September 7, 1974
2	2	"Bem"	7403.6	Bill Reed	David Gerrold	September 14, 1974
1	3	"The Practical Joker"	3183.3	Bill Reed	Chuck Menville	September 21, 1974
1	4	"Albatross"	5275.6	Bill Reed	Dario Finelli	September 28, 1974
1	5	"How Sharper Than a Serpent's Tooth"	6063.4	Bill Reed	Russell Bates and David Wise	October 5, 1974
1	6	"The Counter-Clock Incident"	6770.3	Bill Reed	John Culver	October 12, 1974

[a]This table lists writers as credited on the original air date

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Appendix 3

Star Trek: The Next Generation

Season 1, 1987–1988 to Season 7, 1993–1994

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	1 & 2	"Encounter at Farpoint"	41153.7	Corey Allen	D. C. Fontana and Gene Roddenberry	September 28, 1987
1	3	"The Naked Now"	41209.2	Paul Lynch	Story: John D. F. Black and J. Michael Bingham[1], Teleplay: J. Michael Bingham[1]	October 5, 1987

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	4	"Code of Honor"	41235.25	Russ Mayberry	Katharyn Powers and Michael Baron	October 12, 1987
1	5	"The Last Outpost"	41386.4	Richard Colla	Story: Richard Krzmeien, Teleplay: Herbert Wright	October 19, 1987
1	6	"Where No One Has Gone Before"	41263.1	Rob Bowman	Diane Duane and Michael Reaves	October 26, 1987
1	7	"Lonely Among Us"	41249.3	Cliff Bole	Story: Michael Halperin, Teleplay: D. C. Fontana	November 2, 1987
1	8	"Justice"	41255.6	James L. Conway	Story: Ralph Wills[2] and Worley Thorne, Teleplay: Worley Thorne	November 9, 1987
1	9	"The Battle"	41723.9	Rob Bowman	Story: Larry Forrester, Teleplay: Herbert Wright	November 16, 1987
1	10	"Hide and Q"	41590.5	Cliff Bole	Story: C.J. Holland[3], Teleplay: C.J. Holland[3] and Gene Roddenberry	November 23, 1987
1	11	"Haven"	41294.5	Richard Compton	Story: Tracy Tormé and Lan O'Kun, Teleplay: Tracy Tormé	November 30, 1987
1	12	"The Big Goodbye"	41997.7	Joseph L. Scanlan	Tracy Tormé	January 11, 1988
1	13	"Datalore"	41242.4	Rob Bowman	Story: Robert Lewin and Maurice Hurley, Teleplay: Robert Lewin and Gene Roddenberry	January 18, 1988
1	14	"Angel One"	41636.9	Michael Rhoades	Patrick Barry	January 25, 1988
1	15	"11001001"	41365.9	Paul Lynch	Maurice Hurley and Robert Lewin	February 1, 1988

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	16	"Too Short a Season"	41309.5	Rob Bowman	Story: Michael Michaelian, Teleplay: Michael Michaelian and D. C. Fontana	February 8, 1988
1	17	"When the Bough Breaks"	41509.1	Kim Manners	Hannah Louise Shearer	February 15, 1988
1	18	"Home Soil"	41463.9	Corey Allen	Story: Karl Geurs & Ralph Sanchez and Robert Sabaroff, Teleplay: Robert Sabaroff	February 22, 1988
1	19	"Coming of Age"	41416.2	Mike Vejar	Sandy Fries	March 14, 1988
1	20	"Heart of Glory"	41503.7	Rob Bowman	Story: Maurice Hurley and Herbert Wright & D. C. Fontana, Teleplay: Maurice Hurley	March 21, 1988
1	21	"The Arsenal of Freedom"	41798.2	Les Landau	Story: Maurice Hurley and Robert Lewin, Teleplay: Richard Manning and Hans Beimler	April 11, 1988
1	22	"Symbiosis"	Unknown	Win Phelps	Story: Robert Lewin, Teleplay: Robert Lewin & Richard Manning and Hans Beimler	April 18, 1988
1	23	"Skin of Evil"	41601.3	Joseph L. Scanlan	Story: Joseph Stefano, Teleplay: Joseph Stefano and Hannah Louise Shearer	April 25, 1988
1	24	"We'll Always Have Paris"	41697.9	Robert Becker	Deborah Dean Davis and Hannah Louise Shearer	May 2, 1988

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	25	"Conspiracy"	41775.5	Cliff Bole	Story: Robert Sabaroff, Teleplay: Tracy Tormé	May 9, 1988
1	26	"The Neutral Zone"	41986.0	James L. Conway	Story: Deborah McIntyre & Mona Clee, Teleplay: Maurice Hurley	May 16, 1988
2	1	"The Child"	42073.1	Rob Bowman	Jaron Summers & Jon Povill and Maurice Hurley	November 21, 1988
2	2	"Where Silence Has Lease"	42193.6	Winrich Kolbe	Jack B. Sowards	November 28, 1988
2	3	"Elementary, Dear Data"	42286.3	Rob Bowman	Brian Alan Lane	December 5, 1988
2	4	"The Outrageous Okona"	42402.7	Robert Becker	Story: Les Menchen & Lance Dickson & David Landsberg, Teleplay: Burton Armus	December 12, 1988
2	5	"Loud as a Whisper"	42477.2	Larry Shaw	Jacqueline Zambrano	January 9, 1989
2	6	"The Schizoid Man"	42437.5	Les Landau	Story: Richard Manning & Hans Beimler, Teleplay: Tracy Tormé	January 23, 1989
2	7	"Unnatural Selection"	42494.8	Paul Lynch	John Mason and Mike Gray	January 30, 1989
2	8	"A Matter of Honor"	42506.5	Rob Bowman	Story: Wanda M. Haight & Gregory Amos and Burton Armus, Teleplay: Burton Armus	February 6, 1989
2	9	"The Measure of a Man"	42523.7	Robert Scheerer	Melinda M. Snodgrass	February 13, 1989
2	10	"The Dauphin"	42568.8	Rob Bowman	Scott Rubenstein & Leonard Mlodinow	February 20, 1989
2	11	"Contagion"	42609.1	Joseph L. Scanlan	Steve Gerber & Beth Woods	March 20, 1989

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
2	12	"The Royale"	42625.4	Cliff Bole	Keith Mills	March 27, 1989
2	13	"Time Squared"	42679.2	Joseph L. Scanlan	Story: Kurt Michael Bensmiller, Teleplay: Maurice Hurley	April 3, 1989
2	14	"The Icarus Factor"	42686.4	Robert Iscove	Story: David Assael, Teleplay: David Assael and Robert McCullough	April 24, 1989
2	15	"Pen Pals"	42695.3	Winrich Kolbe	Story: Hannah Louise Shearer, Teleplay: Melinda M. Snodgrass	May 1, 1989
2	16	"Q Who"	42761.3	Rob Bowman	Maurice Hurley	May 8, 1989
2	17	"Samaritan Snare"	42779.1	Les Landau	Robert McCullough	May 15, 1989
2	18	"Up the Long Ladder"	42823.2	Winrich Kolbe	Melinda M. Snodgrass	May 22, 1989
2	19	"Manhunt"	42859.2	Rob Bowman	Terry Devereaux	June 19, 1989
2	20	"The Emissary"	42901.3	Cliff Bole	Story: Richard Manning & Hans Beimler and Thomas H. Calder, Teleplay: Richard Manning & Hans Beimler	June 26, 1989
2	21	"Peak Performance"	42923.4	Robert Scheerer	David Kemper	July 10, 1989
2	22	"Shades of Gray"	42976.1	Rob Bowman	Story: Maurice Hurley, Teleplay: Maurice Hurley and Richard Manning & Hans Beimler	June 17, 1989
3	1	"Evolution"	43125.8	Winrich Kolbe	Story: Michael Piller & Michael Wagner, Teleplay: Michael Piller	September 25, 1989

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
3	2	"The Ensigns of Command"	43133.3	Cliff Bole	Melinda M. Snodgrass	October 2, 1989
3	3	"The Survivors"	43152.4	Les Landau	Michael Wagner	October 9, 1989
3	4	"Who Watches the Watchers"	43173.5	Robert Wiemer	Richard Manning & Hans Beimler	October 16, 1989
3	5	"The Bonding"	43198.7	Winrich Kolbe	Ronald D. Moore	October 23, 1989
3	6	"Booby Trap"	43205.6	Gabrielle Beaumont	Story: Michael Wagner & Ron Roman, Teleplay: Ron Roman and Michael Piller & Richard Danus	October 30, 1989
3	7	"The Enemy"	43349.2	David Carson	David Kemper & Michael Piller	November 6, 1989
3	8	"The Price"	43385.6	Robert Scheerer	Hannah Louise Shearer	November 13, 1989
3	9	"The Vengeance Factor"	43421.9	Timothy Bond	Sam Rolfe	November 20, 1989
3	10	"The Defector"	43462.5	Robert Scheerer	Ronald D. Moore	January 1, 1990
3	11	"The Hunted"	43489.2	Cliff Bole	Robin Bernheim	January 8, 1990
3	12	"The High Ground"	43510.7	Gabrielle Beaumont	Melinda M. Snodgrass	January 29, 1990
3	13	"Déjà Q"	43539.1	Les Landau	Richard Danus	February 5, 1990
3	14	"A Matter of Perspective"	43610.4	Cliff Bole	Ed Zuckerman	February 12, 1990
3	15	"Yesterday's Enterprise"	43625.2	David Carson	Story: Trent Christopher Ganino & Eric A. Stillwell, Teleplay: Ira Steven Behr, Richard Manning, Hans Beimler and Ronald D. Moore	February 19, 1990
3	16	"The Offspring"	43657.0	Jonathan Frakes	René Echevarria	March 12, 1990

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
3	17	"Sins of the Father"	43685.2	Les Landau	Story: Drew Deighan, Teleplay: Ronald D. Moore & W. Reed Moran	March 19, 1990
3	18	"Allegiance"	43714.1	Winrich Kolbe	Richard Manning & Hans Beimler	March 26, 1990
3	19	"Captain's Holiday"	43745.2	Chip Chalmers	Ira Steven Behr	April 2, 1990
3	20	"Tin Man"	43779.3	Robert Scheerer	Dennis Putman Bailey[a] & David Bischoff	April 23, 1990
3	21	"Hollow Pursuits"	43807.4	Cliff Bole	Sally Caves	April 30, 1990
3	22	"The Most Toys"	43872.2	Timothy Bond	Shari Goodhartz	May 7, 1990
3	23	"Sarek"	43917.4	Les Landau	From a story: by Marc Cushman & Jake Jacobs, Television Story and Teleplay: Peter S. Beagle	May 14, 1990
3	24	"Ménage à Troi"	43930.7	Robert Legato	Fred Bronson & Susan Sackett	May 28, 1990
3	25	"Transfigurations"	43957.2	Tom Benko	René Echevarria	June 4, 1990
3	26	"The Best of Both Worlds, Part I"	43989.1	Cliff Bole	Michael Piller	June 18, 1990
4	1	"The Best of Both Worlds, Part II"	44001.4	Cliff Bole	Michael Piller	September 24, 1990
4	2	"Family"	44012.3	Les Landau	Ronald D. Moore	October 1, 1990
4	3	"Brothers"	44085.7	Rob Bowman	Rick Berman	October 8, 1990
4	4	"Suddenly Human"	44143.7	Gabrielle Beaumont	Story: Ralph Phillips, Teleplay: John Whelpley & Jeri Taylor	October 15, 1990
4	5	"Remember Me"	44161.2	Cliff Bole	Lee Sheldon	October 22, 1990
4	6	"Legacy"	44215.2	Robert Scheerer	Joe Menosky	October 29, 1990

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
4	7	"Reunion"	44246.3	Jonathan Frakes	Story: Drew Deighan & Thomas Perry and Jo Perry, Teleplay: Thomas Perry & Jo Perry & Ronald D. Moore and Brannon Braga	November 5, 1990
4	8	"Future Imperfect"	44286.5	Les Landau	J. Larry Carroll & David Bennett Carren	November 12, 1990
4	9	"Final Mission"	44307.3	Corey Allen	Story: Kacey Arnold-Ince, Teleplay: Kacey Arnold-Ince and Jeri Taylor	November 19, 1990
4	10	"The Loss"	44356.9	Chip Chalmers	Story: Hilary J. Bader, Teleplay: Hilary J. Bader & Alan J. Adler and Vanessa Greene	December 31, 1990
4	11	"Data's Day"	44390.1	Robert Wiemer	Story: Harold Apter, Teleplay: Harold Apter and Ronald D. Moore	January 7, 1991
4	12	"The Wounded"	44429.6	Chip Chalmers	Story: Stuart Charno & Sara Charno and Cy Chermak, Teleplay: Jeri Taylor	January 28, 1991
4	13	"Devil's Due"	44474.5	Tom Benko	Story: Philip LaZebnik and William Douglas Lansford, Teleplay: Philip LaZebnik	February 4, 1991
4	14	"Clues"	44502.7	Les Landau	Story: Bruce D. Arthurs, Teleplay: Bruce D. Arthurs and Joe Menosky	February 11, 1991

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
4	15	"First Contact"	44575.2	Cliff Bole	Story: Marc Scott Zicree, Teleplay: Dennis Russell Bailey & David Bischoff and Joe Menosky & Ronald D. Moore and Michael Piller	February 18, 1991
4	16	"Galaxy's Child"	44614.6	Winrich Kolbe	Story: Thomas Kartozian, Teleplay: Maurice Hurley	March 11, 1991
4	17	"Night Terrors"	44631.2	Les Landau	Story: Shari Goodhartz, Teleplay: Pamela Douglas and Jeri Taylor	March 18, 1991
4	18	"Identity Crisis"	44664.5	Winrich Kolbe	Story: Timothy DeHaas, Teleplay: Brannon Braga	March 25, 1991
4	19	"The Nth Degree"	44704.2	Robert Legato	Joe Menosky	April 1, 1991
4	20	"Qpid"	44741.9	Cliff Bole	Story: Randee Russell and Ira Steven Behr, Teleplay: Ira Steven Behr	April 22, 1991
4	21	"The Drumhead"	44769.2	Jonathan Frakes	Jeri Taylor	April 29, 1991
4	22	"Half a Life"	44805.3	Les Landau	Story: Ted Roberts and Peter Allan Fields, Teleplay: Peter Allan Fields	May 6, 1991
4	23	"The Host"	44821.3	Marvin V. Rush	Michel Horvat	May 13, 1991
4	24	"The Mind's Eye"	44885.5	David Livingston	Story: Ken Schafer and René Echevarria, Teleplay: René Echevarria	May 27, 1991

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
4	25	"In Theory"	44932.3	Patrick Stewart	Joe Menosky and Ronald D. Moore	June 3, 1991
5	1	"Redemption, Part II"	45021.3	David Carson	Ronald D. Moore	September 23, 1991
5	2	"Darmok"	45047.2	Winrich Kolbe	Story: Philip LaZebnik and Joe Menosky, Teleplay: Joe Menosky	September 30, 1991
5	3	"Ensign Ro"	45076.3	Les Landau	Story: Rick Berman & Michael Piller, Teleplay: Michael Piller	October 7, 1991
5	4	"Silicon Avatar"	45122.3	Cliff Bole	Story: Lawrence V. Conley, Teleplay: Jeri Taylor	October 14, 1991
5	5	"Disaster"	45156.1	Gabrielle Beaumont	Story: Ron Jarvis & Philip A. Scorza, Teleplay: Ronald D. Moore	October 21, 1991
5	6	"The Game"	45208.2	Corey Allen	Story: Susan Sackett & Fred Bronson and Brannon Braga, Teleplay: Brannon Braga	October 28, 1991
5	7	"Unification, Part I"	45233.1	Les Landau	Story: Rick Berman and Michael Piller, Teleplay: Jeri Taylor	November 4, 1991
5	8	"Unification, Part II"	45245.8	Cliff Bole	Story: Rick Berman and Michael Piller, Teleplay: Michael Piller	November 11, 1991
5	9	"A Matter of Time"	45349.1	Paul Lynch	Rick Berman	November 18, 1991
5	10	"New Ground"	45376.3	Robert Scheerer	Story: Sara Charno and Stuart Charno, Teleplay: Grant Rosenberg	January 6, 1992

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
5	11	"Hero Worship"	45397.3	Patrick Stewart	Story: Hilary J. Bader, Teleplay: Joe Menosky	January 27, 1992
5	12	"Violations"	45429.3	Robert Wiemer	Story: Shari Goodhartz and T. Michael and Pamela Gray, Teleplay: Pamela Gray and Jeri Taylor	February 3, 1992
5	13	"The Masterpiece Society"	45470.1	Winrich Kolbe	Story: James Kahn and Adam Belanoff, Teleplay: Adam Belanoff and Michael Piller	February 10, 1992
5	14	"Conundrum"	45494.2	Les Landau	Story: Paul Schiffer, Teleplay: Barry Schkolnick	February 17, 1992
5	15	"Power Play"	45571.2	David Livingston	Story: Paul Ruben and Maurice Hurley, Teleplay: René Balcer and Herbert Wright & Brannon Braga	February 24, 1992
5	16	"Ethics"	45587.3	Chip Chalmers	Story: Sara Charno & Stuart Charno, Teleplay: Ronald D. Moore	March 2, 1992
5	17	"The Outcast"	45614.6	Robert Scheerer	Jeri Taylor	March 16, 1992
5	18	"Cause and Effect"	45652.1	Jonathan Frakes	Brannon Braga	March 23, 1992
5	19	"The First Duty"	45703.9	Paul Lynch	Ronald D. Moore & Naren Shankar	March 30, 1992
5	20	"Cost of Living"	45733.6	Winrich Kolbe	Peter Allan Fields	April 20, 1992

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
5	21	"The Perfect Mate"	45761.3	Cliff Bole	Story: René Echevarria and Gary Perconte, Teleplay: Gary Perconte and Michael Piller	April 27, 1992
5	22	"Imaginary Friend"	45852.1	Gabrielle Beaumont	Story: Jean Louise Matthias & Ronald Wilkerson and Richard Fliegel, Teleplay: Edithe Swensen and Brannon Braga	May 4, 1992
5	23	"I, Borg"	45854.2	Robert Lederman	René Echevarria	May 11, 1992
5	24	"The Next Phase"	45892.4	David Carson	Ronald D. Moore	May 18, 1992
5	25	"The Inner Light"	45944.1	Peter Lauritson	Story: Morgan Gendel, Teleplay: Morgan Gendel and Peter Allan Fields	June 1, 1992
5	26	"Time's Arrow, Part I"	45959.1	Les Landau	Story: Joe Menosky, Teleplay: Joe Menosky and Michael Piller	June 15, 1992
6	1	"Time's Arrow, Part II"	46001.3	Les Landau	Story: Joe Menosky, Teleplay: Jeri Taylor	September 21, 1992
6	2	"Realm of Fear"	46041.1	Cliff Bole	Brannon Braga	September 28, 1992
6	3	"Man of the People"	46071.6	Winrich Kolbe	Frank Abatemarco	October 5, 1992
6	4	"Relics"	46125.3	Alexander Singer	Ronald D. Moore	October 12, 1992
6	5	"Schisms"	46154.2	Robert Wiemer	Story: Jean Louise Matthias & Ronald Wilkerson, Teleplay: Brannon Braga	October 19, 1992

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
6	6	"True Q"	46192.3	Robert Scheerer	René Echevarria	October 26, 1992
6	7	"Rascals"	46235.7	Adam Nimoy	Story: Ward Botsford & Diana Dru Botsford and Michael Piller, Teleplay: Allison Hock	November 2, 1992
6	8	"A Fistful of Datas"	46271.5	Patrick Stewart	Story: Robert Hewitt Wolfe, Teleplay: Robert Hewitt Wolfe and Brannon Braga	November 9, 1992
6	9	"The Quality of Life"	46307.2	Jonathan Frakes	Naren Shankar	November 16, 1992
6	10	"Chain of Command, Part I"	46357.4	Robert Scheerer	Story: Frank Abatemarco, Teleplay: Ronald D. Moore	December 14, 1992
6	11	"Chain of Command, Part II"	46360.8	Les Landau	Frank Abatemarco	December 21, 1992
6	12	"Ship in a Bottle"	46424.1	Alexander Singer	René Echevarria	January 25, 1993
6	13	"Aquiel"	46461.3	Cliff Bole	Story: Jeri Taylor, Teleplay: Brannon Braga & Ronald D. Moore	February 1, 1993
6	14	"Face of the Enemy"	46519.1	Gabrielle Beaumont	Story: René Echevarria, Teleplay: Naren Shankar	February 8, 1993
6	15	"Tapestry"	Unknown	Les Landau	Ronald D. Moore	February 15, 1993
6	16	"Birthright, Part I"	46578.4	Winrich Kolbe	Brannon Braga	February 22, 1993
6	17	"Birthright, Part II"	46579.2	Dan Curry	René Echevarria	March 1, 1993
6	18	"Starship Mine"	46682.4	Cliff Bole	Morgan Gendel	March 29, 1993
6	19	"Lessons"	46693.1	Robert Wiemer	Ronald Wilkerson & Jean Louise Matthias	April 5, 1993

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
6	20	"The Chase"	46731.5	Jonathan Frakes	Story: Ronald D. Moore & Joe Menosky, Teleplay: Joe Menosky	April 26, 1993
6	21	"Frame of Mind"	46778.1	James L. Conway	Brannon Braga	May 3, 1993
6	22	"Suspicions"	46830.1	Cliff Bole	Joe Menosky and Naren Shankar	May 10, 1993
6	23	"Rightful Heir"	46852.2	Winrich Kolbe	Story: James E. Brooks, Teleplay: Ronald D. Moore	May 17, 1993
6	24	"Second Chances"	46915.2	LeVar Burton	Story: Michael A. Medlock, Teleplay: René Echevarria	May 24, 1993
6	25	"Timescape"	46944.2	Adam Nimoy	Brannon Braga	June 14, 1993
6	26	"Descent, Part I"	46982.1	Alexander Singer	Story: Jeri Taylor, Teleplay: Ronald D. Moore	June 21, 1993
7	1	"Descent, Part II"	47025.4	Alexander Singer	René Echevarria	September 20, 1993
7	2	"Liaisons"	Unknown	Cliff Bole	Story: Roger Eschbacher & Jaq Greenspon, Teleplay: Jeanne Carrigan-Fauci & Lisa Rich	September 27, 1993
7	3	"Interface"	47215.5	Robert Wiemer	Joe Menosky	October 4, 1993
7	4	"Gambit, Part I"	47135.2	Peter Lauritson	Story: Christopher Hatton and Naren Shankar, Teleplay: Naren Shankar	October 11, 1993

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
7	5	"Gambit, Part II"	47160.1	Alexander Singer	Story: Naren Shankar, Teleplay: Ronald D. Moore	October 18, 1993
7	6	"Phantasms"	47225.7	Patrick Stewart	Brannon Braga	October 25, 1993
7	7	"Dark Page"	47254.1	Les Landau	Hilary J. Bader	November 1, 1993
7	8	"Attached"	47304.2	Jonathan Frakes	Nicholas Sagan	November 8, 1993
7	9	"Force of Nature"	47310.2	Robert Lederman	Naren Shankar	November 15, 1993
7	10	"Inheritance"	47410.2	Robert Scheerer	Story: Dan Koeppel, Teleplay: Dan Koeppel and René Echevarria	November 22, 1993
7	11	"Parallels"	47391.2	Robert Wiemer	Brannon Braga	November 29, 1993
7	12	"The Pegasus"	47457.1	LeVar Burton	Ronald D. Moore	January 10, 1994
7	13	"Homeward"	47423.9	Alexander Singer	Story: Spike Steingasser, Teleplay: Naren Shankar	January 17, 1994
7	14	"Sub Rosa"	Unknown	Jonathan Frakes	Story: Jeri Taylor, Teleplay: Brannon Braga	January 31, 1994
7	15	"Lower Decks"	47566.7	Gabrielle Beaumont	Story: Ronald Wilkerson & Jean Louise Matthias, Teleplay: René Echevarria	February 7, 1994
7	16	"Thine Own Self"	47611.2	Winrich Kolbe	Story: Christopher Hatton, Teleplay: Ronald D. Moore	February 14, 1994
7	17	"Masks"	47615.2	Robert Wiemer	Joe Menosky	February 21, 1994

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
7	18	"Eye of the Beholder"	47622.1	Cliff Bole	Story: Brannon Braga, Teleplay: René Echevarria	February 28, 1994
7	19	"Genesis"	47653.2	Gates McFadden	Brannon Braga	March 21, 1994
7	20	"Journey's End"	47751.2	Corey Allen	Ronald D. Moore	March 28, 1994
7	21	"Firstborn"	47779.4	Jonathan West	Story: Mark Kalbfeld, Teleplay: René Echevarria	April 25, 1994
7	22	"Bloodlines"	47829.1	Les Landau	Nicholas Sagan	May 2, 1994
7	23	"Emergence"	47869.2	Cliff Bole	Story: Brannon Braga, Teleplay: Joe Menosky	May 9, 1994
7	24	"Preemptive Strike"	47941.7	Patrick Stewart	Story: Naren Shankar, Teleplay: René Echevarria	May 16, 1994
7	25 and 26	"All Good Things..."	47988	Winrich Kolbe	Ronald D. Moore & Brannon Braga	May 23, 1994

[a]This table lists writers as credited on the original air date
[1] J. Michael Bingham is a pseudonym used by D. C. Fontana
[2] Ralph Wills is a pseudonym used by John D. F. Black
[3] C. J. Holland is a pseudonym used by the head writer and show runner for seasons 1 and 2, Maurice Hurley

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Appendix 4

Star Trek: Deep Space Nine
Season 1, 1993 to Season 7, 1998–1999

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	1×01/02	Emissary	46379.1	David Carson	Story by: Rick Berman and Michael Piller, Teleplay by: Michael Piller	03.01.1993
1	1×03	Past Prologue	Unknown	Winrich Kolbe	Katharyn Powers	09.01.1993
1	1×04	A Man Alone	46421.5	Paul Lynch	Story by: Gerald Sanford & Michael Piller, Teleplay by: Michael Piller	17.01.1993
1	1×05	Babel	46423.7	Paul Lynch	Story by: Sally Caves & Ira Steven Behr, Teleplay by: Michael McGreevey & Naren Shankar	24.01.1993
1	1×06	Captive Pursuit	46477.5	Corey Allen	Story by: Jill Sherman Donner, Teleplay by: Jill Sherman Donner and Michael Piller	30.01.1993
1	1×07	Q-Less	46531.2	Paul Lynch	Story by: Hannah Louise Shearer, Teleplay by: Robert Hewitt Wolfe	06.02.1993
1	1×08	Dax	46910.1	David Carson	Story by: Peter Allan Fields, Teleplay by: D. C. Fontana and Peter Allan Fields	13.02.1993
1	1×09	The Passenger	Unknown	Paul Lynch	Story by: Morgan Gendel, Teleplay by: Morgan Gendel & Robert Hewitt Wolfe and Michael Piller	20.02.1993

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	1×10	Move Along Home	46612.4	David Carson	Story by: Michael Piller, Teleplay by: Frederick Rappaport and Lisa Rich & Jeanne Carrigan-Fauci	14.03.1993
1	1×11	The Nagus	46657.0	David Livingston	Story: David Livingstone, Teleplay: Ira Steven Behr	21.03.1993
1	1×12	Vortex	46689.6	Winrich Kolbe	Sam Rolfe	18.04.1993
1	1×13	Battle Lines	46715.2	Paul Lynch	Story by: Hilary J. Bader, Teleplay by: Richard Danus and Evan Carlos Somers	25.04.1993
1	1×14	The Storyteller	46729.1	David Livingstone	Story by: Kurt Michael Bensmiller, Teleplay by: Kurt Michael Bensmiller and Ira Steven Behr	02.05.1993
1	1×15	Progress	46844.3	Les Landau	Peter Allan Fields	09.05.1993
1	1×16	If Wishes Were Horses	46853.2	Robert Logato	Story by: Nell McCue Crawford & William L. Crawford, Teleplay by: Nell McCue Crawford & William L. Crawford and Michael Piller	16.05.1993
1	1×17	The Forsaken	46925.1	Les Landau	Story by: Jim Trombetta, Teleplay by: Don Carlos Dunaway and Michael Piller	23.05.1993
1	1×18	Dramatis Personae	46922.3	Cliff Bole	Joe Menosky	30.05.1993

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	1×19	Duet	46933.4	James L. Conway	Story by: Lisa Rich & Jeanne Carrigan-Fauci, Teleplay by: Peter Allan Fields	13.06.1993
1	1×20	In the Hands of the Prophets	46951.7	David Livingstone	Robert Hewitt Wolfe	20.06.1993
2	2×01	The Homecoming	47101.2	Winrich Kolbe	Story by: Jeri Taylor and Ira Steven Behr, Teleplay by: Ira Steven Behr	26.09.1993
2	2×02	The Circle	Unknown	Corey Allen	Peter Allan Fields	03.10.1993
2	2×03	The Siege	Unknown	Winrich Kolbe	Michael Piller	10.10.1993
2	2×04	Invasive Procedures	47182.1	Les Landau	Story by: John Whelpley, Teleplay by: John Whelpley and Robert Hewitt Wolfe	17.10.1993
2	2×05	Cardassians	47177.2	Cliff Bole	Story by: Gene Wolande & John Wright, Teleplay by: James Crocker	24.10.1993
2	2×06	Melora	47229.1	Winrich Kolbe	Story by: Evan Carlos Somers, Teleplay by: Evan Carlos Somers and Steven Baum and Michael Piller & James Crocker	31.10.1993
2	2×07	Rules of Acquisition	Unknown	David Livingston	Story by: Hilary J. Bader, Teleplay by: Ira Steven Behr	06.11.1993
2	2×08	Necessary Evil	47282.5–47284.1	James L. Conway	Peter Allan Fields	14.11.1993

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
2	2×09	Second Sight	47329.4	Alexander Singer	Story by: Mark Gehred-O'Connell, Teleplay by: Mark Gehred-O'Connell & Ira Steven Behr and Robert Hewitt Wolfe	20.11.1993
2	2×10	Sanctuary	47391.2	Les Landau	Story by: Gabe Essoe & Kelley Mile, Teleplay by: Frederick Rappaport	28.11.1993
2	2×11	Rivals	Unknown	David Livingston	Story by: Jim Trombetta & Michael Piller, Teleplay by: Joe Menosky	02.01.1994
2	2×12	The Alternate	47391.7	David Carson	Story by: Jim Trombetta and Bill Dial, Teleplay by: Bill Dial	09.01.1994
2	2×13	Armageddon Game	Unknown	Winrich Kolbe	Morgan Gendel	30.01.1994
2	2×14	Whispers	47581.2	Les Landau	Paul Robert Coyle	06.02.1994
2	2×15	Paradise	47573.1	Corey Allen	Story by: Jim Trombetta and James Crocker, Teleplay by: Jeff King and Richard Manning & Hans Beimler	13.02.1994
2	2×16	Shadowplay	47603.3	Robert Scheerer	Robert Hewitt Wolfe	20.02.1994
2	2×17	Playing God	Unknown	David Livingston	Story by: Jim Trombetta, Teleplay by: Jim Trombetta and Michael Piller	27.02.1994
2	2×18	Profit and Loss	Unknown	Robert Wiemer	Flip Kobler and Cindy Marcus	20.03.1994

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
2	2×19	Blood Oath	Unknown	Winrich Kolbe	19 Based on material by: Andrea Moore Alton, Television Story and Teleplay by: Peter Allan Fields	27.03.1994
2	2×20	The Maquis, Part I	Unknown	David Livingston	Story by: Rick Berman and Michael Piller & Jeri Taylor and James Crocker, Teleplay by: James Crocker	24.04.1994
2	2×21	The Maquis, Part II	Unknown	Corey Allen	Story by: Rick Berman and Michael Piller & Jeri Taylor and Ira Steven Behr, Teleplay by: Ira Steven Behr	01.05.1994
2	2×22	The Wire	Unknown	Kim Friedman	Robert Hewitt Wolfe	08.05.1994
2	2×23	Crossover	Unknown	David Livingston	Story by: Peter Allan Fields, Teleplay by: Peter Allan Fields and Michael Piller	15.05.1994
2	2×24	The Collaborator	Unknown	Cliff Bole	Story by: Gary Holland, Teleplay by: Gary Holland & Ira Steven Behr and Robert Hewitt Wolfe	22.05.1994
2	2×25	Tribunal	47944.2	Avery Brooks	Bill Dial	05.06.1994
2	2×26	The Jem'Hadar	Unknown	Kim Friedman	Ira Steven Behr	12.06.1994
3	3×01	The Search, Part I	48213.1	Kim Friedman	Story by: Ira Steven Behr and Robert Hewitt Wolfe, Teleplay by: Ronald D. Moore	26.09.1994

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
3	3×02	The Search, Part II	48217.7	Jonathan Frakes	Story by: Ira Steven Behr and Robert Hewitt Wolfe, Teleplay by: Ira Steven Behr	03.10.1994
3	3×03	The House of Quark	48224.2	Les Landau	Story by: Tom Benko, Teleplay by: Ronald D. Moore	10.10.1994
3	3×04	Equilibrium	Unknown	Cliff Bole	Story by: Christopher Teague, Teleplay by: René Echevarria	17.10.1994
3	3×05	Second Skin	48244.5	Les Landau	Robert Hewitt Wolfe	24.10.1994
3	3×06	The Abandoned	48301.1	Avery Brooks	D. Thomas Maio and Steve Warnek	31.10.1994
3	3×07	Civil Defense	48388.8	Reza Badiyi	Mike Krohn	07.11.1994
3	3×08	Meridian	48423.2	Jonathan Frakes	Story by: Hilary J. Bader and Evan Carlos Somers, Teleplay by: Mark Gehred-O'Connell	14.11.1994
3	3×09	Defiant	48467.3	Cliff Bole	Ronald D. Moore	21.11.1994
3	3×10	Fascination	Unknown	Avery Brooks	Story by: Ira Steven Behr and James Crocker, Teleplay by: Philip LaZebnik	28.11.1994
3	3×11	Past Tense, Part I	48481.2	Reza Badiyi	Story by: Ira Steven Behr and Robert Hewitt Wolfe, Teleplay by: Robert Hewitt Wolfe	08.01.1995
3	3×12	Past Tense, Part II	48481.2	Jonathan Frakes	Story by: Ira Steven Behr and Robert Hewitt Wolfe, Teleplay by: Ira Steven Behr and René Echevarria	15.01.1995

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
3	3×13	Life Support	48498.4	Reza Badiyi	Story by: Christian Ford and Roger Soffer, Teleplay by: Ronald D. Moore	31.01.1995
3	3×14	Heart of Stone	48521.5	Alexander Singer	Ira Steven Behr and Robert Hewitt Wolfe	06.02.1995
3	3×15	Destiny	48543.2	Les Landau	David S. Cohen and Martin A. Winer	13.02.1995
3	3×16	Prophet Motive	Unknown	René Auberjonois	Ira Steven Behr and Robert Hewitt Wolfe	20.02.1995
3	3×17	Visionary	48576.7	Reza Badiyi	Story by: Ethan H. Calk, Teleplay by: John Shirley	27.02.1995
3	3×18	Distant Voices	48592.2	Alexander Singer	Story by: Joe Menosky, Teleplay by: Ira Steven Behr & Robert Hewitt Wolfe	10.04.1995
3	3×19	Through the Looking Glass	Unknown	Winrich Kolbe	Ira Steven Behr and Robert Hewitt Wolfe	17.04.1995
3	3×20	Improbable Cause	Unknown	Avery Brooks	Story by: Robert Lederman & David R. Long, Teleplay by: René Echevarria	24.04.1995
3	3×21	The Die is Cast	Unknown	David Livingston	Ronald D. Moore	01.05.1995
3	3×22	Explorers	Unknown	Cliff Bole	Story by: Hilary J. Bader, Teleplay by: René Echevarria	08.05.1995
3	3×23	Family Business	Unknown	René Auberjonois	Ira Steven Behr and Robert Hewitt Wolfe	15.05.1995
3	3×24	Shakaar	Unknown	Jonathan West	Gordon Dawson	22.05.1995
3	3×25	Facets	48876.3	Cliff Bole	René Echevarria	12.06.1995
3	3×26	The Adversary	48959.1	Alexander Singer	Ira Steven Behr and Robert Hewitt Wolfe	25.06.1995

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
4	4×01/02	The Way of the Warrior	49011.4	James L. Conway	Ira Steven Behr and Robert Hewitt Wolfe	02.10.1995
4	4×03	The Visitor	49034.7	David Livingston	Michael Taylor	09.10.1995
4	4×04	Hippocratic Oath	49066.5	René Auberjonois	Story by: Nicholas Corea and Lisa Klink, Teleplay by: Lisa Klink	16.10.1995
4	4×05	Indiscretion	Unknown	LeVar Burton	Story by: Toni Marberry & Jack Treviño, Teleplay by: Nicholas Corea	23.10.1995
4	4×06	Rejoined	49195.5	Avery Brooks	Story by: René Echevarria, Teleplay by: Ronald D. Moore and René Echevarria	30.10.1995
4	4×07	Starship Down	49263.5	Alexander Singer	David Mack and John J. Ordover	13.11.1995
4	4×08	Little Green Men	Unknown	James L. Conway	Story by: Toni Marberry & Jack Treviño, Teleplay by: Ira Steven Behr & Robert Hewitt Wolfe	15.11.1995
4	4×09	The Sword of Kahless	49289.1	LeVar Burton	Story by: Richard Danus, Teleplay by: Hans Beimler	20.11.1995
4	4×10	Our Man Bashir	49300.7	Winrich Kolbe	Story by: Robert Gillan, Teleplay by: Ronald D. Moore	27.11.1995
4	4×11	Homefront	49170.65	David Livingston	Ira Steven Behr and Robert Hewitt Wolfe	01.01.1996
4	4×12	Paradise Lost	Unknown	Reza Badiyi	Story by: Ronald D. Moore, Teleplay by: Ira Steven Behr and Robert Hewitt Wolfe	08.01.1996

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
4	4×13	Crossfire	Unknown	Les Landau	René Echevarria	29.01.1996
4	4×14	Return to Grace	Unknown	Jonathan West	Story by: Tom Benko, Teleplay by: Hans Beimler	05.02.1996
4	4×15	Sons of Mogh	49556.2	David Livingston	Ronald D. Moore	12.02.1996
4	4×16	Bar Association	Unknown	LeVar Burton	Story by: Barbara J. Lee & Jenifer A. Lee, Teleplay by: Robert Hewitt Wolfe and Ira Steven Behr	19.02.1996
4	4×17	Accession	Unknown	Les Landau	Jane Espenson	24.02.1996
4	4×18	Rules of Engagement	49665.3	LeVar Burton	Story by: David Weddle & Bradley Thompson, Teleplay by: Ronald D. Moore	08.04.1996
4	4×19	Hard Time	Unknown	Alexander Singer	Story by: Daniel Keys Moran and Lynn Barker, Teleplay by: Robert Hewitt Wolfe	15.04.1996
4	4×20	Shattered Mirror	Unknown	James L. Conway	Ira Steven Behr and Hans Beimler	22.04.1996
4	4×21	The Muse	Unknown	David Livingston	Story by: René Echevarria and Majel Barrett-Roddenberry, Teleplay by: René Echevarria	29.04.1996
4	4×22	For the Cause	Unknown	James L. Conway	Story by: Mark Gehred-O'Connell, Teleplay by: Ronald D. Moore	06.05.1996
4	4×23	To the Death	49904.2	LeVar Burton	Ira Steven Behr and Robert Hewitt Wolfe	13.05.1996
4	4×24	The Quickening	Unknown	René Auberjonois	Naren Shankar	20.05.1996

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
4	4×25	Body Parts	49930.3	Avery Brooks	Story by: Louis P. DeSantis & Robert J. Bolivar, Teleplay by: Hans Beimler	10.06.1996
4	4×26	Broken Link	49962.4	Les Landau	Story by: George A. Brozak, Teleplay by: Ira Steven Behr and Robert Hewitt Wolfe	17.06.1996
5	5×01	Apocalypse Rising	Unknown	James L. Conway	Ira Steven Behr and Robert Hewitt Wolfe	30.09.1996
5	5×02	The Ship	50049.3	Kim Friedman	Story by: Pam Wigginton & Rick Cason, Teleplay by: Hans Beimler	07.10.1996
5	5×03	Looking for par'Mach in All the Wrong Places	50061.2	Andrew J. Robinson	Ronald D. Moore	14.10.1996
5	5×04	Nor the Battle to the Strong	Unknown	Kim Friedman	Story by: Brice R. Parker, Teleplay by: René Echevarria	21.10.1996
5	5×05	The Assignment	Unknown	Allan Kroeker	Story by: David R. Long & Robert Lederman, Teleplay by: David Weddle & Bradley Thompson	28.10.1996
5	5×06	Trials and Tribble-ations	4523.7	Jonathan West	Story by: Ira Steven Behr and Hans Beimler & Robert Hewitt Wolfe, Teleplay by: Ronald D. Moore & René Echevarria	04.11.1996
5	5×07	Let He Who Is Without Sin...	Unknown	René Auberjonois	Robert Hewitt Wolfe and Ira Steven Behr	11.11.1996

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
5	5×08	Things Past	Unknown	LeVar Burton	Michael Taylor	18.11.1996
5	5×09	The Ascent	Unknown	Allan Kroeker	Ira Steven Behr and Robert Hewitt Wolfe	25.11.1996
5	5×10	Rapture	Unknown	Jonathan West	Story by: L.J. Strom, Teleplay by: Hans Beimler	30.12.1996
5	5×11	The Darkness and the Light	50416.2	Mike Vejar	Story by: Bryan Fuller, Teleplay by: Ronald D. Moore	06.01.1997
5	5×12	The Begotten	Unknown	Jesús Salvador Treviño	René Echevarria	27.01.1997
5	5×13	For the Uniform	50485.2	Victor Lobl	Peter Allan Fields	03.02.1997
5	5×14	In Purgatory's Shadow	Unknown	Gabrielle Beaumont	Robert Hewitt Wolfe and Ira Steven Behr	10.02.1997
5	5×15	By Inferno's Light	50564.2	Les Landau	Ira Steven Behr and Robert Hewitt Wolfe	17.02.1997
5	5×16	Doctor Bashir, I Presume	Unknown	David Livingston	Story by: Jimmy Diggs, Teleplay by: Ronald D. Moore	24.02.1997
5	5×17	A Simple Investigation	Unknown	John T. Kretchmer	René Echevarria	31.03.1997
5	5×18	Business as Usual	Unknown	Siddig El Fadil	Bradley Thompson and David Weddle	05.04.1997
5	5×19	Ties of Blood and Water	50712.5	Avery Brooks	Story by: Edmund Newton & Robbin L. Slocum, Teleplay by: Robert Hewitt Wolfe	14.04.1997
5	5×20	Ferengi Love Songs	Unknown	René Auberjonois	Ira Steven Behr and Hans Beimler	21.04.1997
5	5×21	Soldiers of the Empire	Unknown	LeVar Burton	Ronald D. Moore	29.04.1997
5	5×22	Children of Time	50814.2	Allan Kroeker	Story by: Gary Holland and Ethan H. Calk, Teleplay by: René Echevarria	05.05.1997

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
5	5×23	Blaze of Glory	Unknown	Kim Friedman	Robert Hewitt Wolfe and Ira Steven Behr	12.05.1997
5	5×24	Empok Nor	50901.7	Mike Vejar	Story by: Bryan Fuller, Teleplay by: Hans Beimler	19.05.1997
5	5×25	In the Cards	50929.4	Michael Dorn	Story by: Truly Barr Clark & Scott J. Neal, Teleplay by: Ronald D. Moore	09.06.1997
5	5×26	Call to Arms	50975.2	Allan Kroeker	Ira Steven Behr and Robert Hewitt Wolfe	16.06.1997
6	6×01	A Time to Stand	Unknown	Allan Kroeker	Ira Steven Behr & Hans Beimler	29.09.1997
6	6×02	Rocks and Shoals	51096.2	Mike Vejar	Ronald D. Moore	06.10.1997
6	6×03	Sons and Daughters	Unknown	Jesús Salvador Treviño	Bradley Thompson & David Weddle	16.10.1997
6	6×04	Behind the Lines	51145.3	LeVar Burton	René Echevarria	20.10.1997
6	6×05	Favor the Bold	Unknown	Winrich Kolbe	Ira Steven Behr & Hans Beimler	27.10.1997
6	6×06	Sacrifice of Angels	Unknown	Allan Kroeker	Ira Steven Behr & Hans Beimler	03.11.1997
6	6×07	You Are Cordially Invited	51247.5	David Livingston	Ronald D. Moore	10.11.1997
6	6×08	Resurrection	Unknown	LeVar Burton	Michael Taylor	17.11.1997
6	6×09	Statistical Probabilities	Unknown	Anson Williams	Story by: Pam Pietroforte, Teleplay by: René Echevarria	22.11.1997
6	6×10	The Magnificent Ferengi	Unknown	Chip Chalmers	Ira Steven Behr & Hans Beimler	17.12.1997
6	6×11	Waltz	51408.6–51413.6	René Auberjonois	Ronald D. Moore	03.01.1998
6	6×12	Who Mourns for Morn?	Unknown	Victor Lobl	Mark Gehred-O'Connell	04.02.1998
6	6×13	Far Beyond the Stars	Unknown	Avery Brooks	Story by: Marc Scott Zicree, Teleplay by: Ira Steven Behr & Hans Beimler	11.02.1998

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
6	6×14	One Little Ship	51474.2	Allan Kroeker	David Weddle & Bradley Thompson	14.02.1998
6	6×15	Honor Among Thieves	Unknown	Allan Eastman	Story by: Philip Kim, Teleplay by: René Echevarria	21.02.1998
6	6×16	Change of Heart	51597.2	David Livingston	Ronald D. Moore	28.02.1998
6	6×17	Wrongs Darker Than Death or Night	Unknown	Jonathan West	Ira Steven Behr & Hans Beimler	28.03.1998
6	6×18	Inquisition	Unknown	Michael Dorn	Bradley Thompson & David Weddle	08.04.1998
6	6×19	In the Pale Moonlight	51721.3	Victor Lobl	Story by: Peter Allan Fields, Teleplay by: Michael Taylor	15.04.1998
6	6×20	His Way	Unknown	Allan Kroeker	Ira Steven Behr & Hans Beimler	22.04.1998
6	6×21	The Reckoning	Unknown	Jesús Salvador Treviño	Story by: Harry M. Werksman & Gabrielle Stanton, Teleplay by: David Weddle & Bradley Thompson	29.04.1998
6	6×22	Valiant	51825.4	Mike Vejar	Ronald D. Moore	06.05.1998
6	6×23	Profit and Lace	Unknown	Siddig El Faddil	Ira Steven Behr & Hans Beimler	13.05.1998
6	6×24	Time's Orphan	Unknown	Allan Kroeker	Story by: Joe Menosky, Teleplay by: David Weddle & Bradley Thompson	20.05.1998
6	6×25	The Sound of Her Voice	51948.3	Winrich Kolbe	Story by: Pam Pietroforte, Teleplay by: Ronald D. Moore	10.06.1998
6	6×26	Tears of the Prophets	Unknown	Allan Kroeker	Ira Steven Behr & Hans Beimler	17.06.1998
7	7×01	Image in the Sand	Unknown	Les Landau	Ira Steven Behr & Hans Beimler	30.09.1998

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
7	7×02	Shadows and Symbols	52152.6	Allan Kroeker	Ira Steven Behr & Hans Beimler	07.10.1998
7	7×03	Afterimage	Unknown	Les Landau	René Echevarria	14.10.1998
7	7×04	Take Me Out to the Holosuite	Unknown	Chip Chalmers	Ronald D. Moore	21.10.1998
7	7×05	Chrysalis	Unknown	Jonathan West	René Echevarria	28.10.1998
7	7×06	Treachery, Faith and the Great River	Unknown	Steve Posey	Story by: Philip Kim, Teleplay by: David Weddle & Bradley Thompson	04.11.1998
7	7×07	Once More Unto the Breach	Unknown	Allan Kroeker	Ronald D. Moore	11.11.1998
7	7×08	The Siege of AR-558	Unknown	Winrich Kolbe	Ira Steven Behr & Hans Beimler	18.11.1998
7	7×09	Covenant	Unknown	John Kretchmer	René Echevarria	25.11.1998
7	7×10	It's Only a Paper Moon	Unknown	Anson Williams	Story by: David Mack & John J. Ordover, Teleplay by: Ronald D. Moore	30.12.1998
7	7×11	Prodigal Daughter	Unknown	Victor Lobl	David Weddle & Bradley Thompson	06.01.1999
7	7×12	The Emperor's New Cloak	Unknown	LeVar Burton	Ira Steven Behr & Hans Beimler	03.02.1999
7	7×13	Field of Fire	Unknown	Tony Dow	Robert Hewitt Wolfe	10.02.1999
7	7×14	Chimera	Unknown	Steve Posey	René Echevarria	17.02.1999
7	7×15	Badda-Bing, Badda-Bang	Unknown	Mike Vejar	Ira Steven Behr & Hans Beimler	24.02.1999
7	7×16	Inter Arma Enim Silent Leges	Unknown	David Livingston	Ronald D. Moore	03.03.1999
7	7×17	Penumbra	52576.2	Steve Posey	René Echevarria	07.04.1999
7	7×18	'Til Death Do Us Part	Unknown	Winrich Kolbe	Bradley Thompson & David Weddle	14.04.1999
7	7×19	Strange Bedfellows	Unknown	René Auberjonois	Ronald D. Moore	21.04.1999
7	7×20	The Changing Face of Evil	Unknown	Mike Vejar	Ira Steven Behr & Hans Beimler	28.04.1999

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
7	7×21	When It Rains...	52684.3	Michael Dorn	Story by: René Echevarria & Spike Steingasser, Teleplay by: René Echevarria	05.05.1999
7	7×22	Tacking Into the Wind	Unknown	Mike Vejar	Ronald D. Moore	12.05.1999
7	7×23	Extreme Measures	52645.7	Steve Posey	David Weddle & Bradley Thompson	19.05.1999
7	7×24	The Dogs of War	52861.3	Avery Brooks	Story by: Peter Allan Fields, Teleplay by: René Echevarria & Ronald D. Moore	26.05.1999
7	7×25/26	What You Leave Behind	52902.0	Allan Kroeker	Ira Steven Behr & Hans Beimler	02.06.1999

[a]This table lists writers as credited on the original air date

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Appendix 5

Star Trek: Voyager

Season 1, 1995 to Season 7, 2000–2001

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	1 & 2	Caretaker	48315.6	Winrich Kolbe	Story by: Rick Berman, Michael Piller and Jeri Taylor, Teleplay by: Michael Piller and Jeri Taylor	January 16, 1995
1	3	Parallax	48439.7	Kim Friedman	Story by: Jim Trombetta, Teleplay by: Brannon Braga	January 23, 1995

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	4	Time and Again	Unknown	Les Landau	Story by: David Kemper, Teleplay by: David Kemper and Michael Piller	January 30, 1995
1	5	Phage	48532.4	Winrich Kolbe	Story by: Timothy DeHaas, Teleplay by: Skye Dent and Brannon Braga	February 6, 1995
1	6	The Cloud	48546.2	David Livingston	Story by: Brannon Braga, Teleplay by: Tom Szollosi and Michael Piller	February 13, 1995
1	7	Eye of the Needle	48579.4	Winrich Kolbe	Story by: Hilary J. Bader, Teleplay by: Bill Dial and Jeri Taylor	February 20, 1995
1	8	Ex Post Facto	Unknown	LeVar Burton	Story by: Evan Carlos Somers, Teleplay by: Evan Carlos Somers and Michael Piller	February 27, 1995
1	9	Emanations	48623.5	David Livingston	Brannon Braga	March 13, 1995
1	10	Prime Factors	48642.5	Les Landau	Story by: David R. George IIIand Eric A. Stillwell, Teleplay by: Michael Perricone and Greg Elliot	March 20, 1995
1	11	State of Flux	48658.2	Robert Scheerer	Story by: Paul Robert Coyle, Teleplay by: Chris Abbott	April 10, 1995
1	12	Heroes and Demons	48693.2	Les Landau	Naren Shankar	April 24, 1995
1	13	Cathexis	48734.2	Kim Friedman	Story by: Brannon Braga and Joe Menosky, Teleplay by: Brannon Braga	May 1, 1995

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	14	Faces	48784.2	Winrich Kolbe	Story by: Jonathan Glassner and Kenneth Biller, Teleplay by: Kenneth Biller	May 8, 1995
1	15	Jetrel	48832.1	Kim Friedman	Story by: James Thomton and Scott Nimerfro, Teleplay by: Jack Klein, Karen Klein and Kenneth Biller	May 15, 1995
2	1	"The 37s"	48975.1	James L. Conway	Jeri Taylor and Brannon Braga	August 28, 1995
2	2	"Initiations"	49005.3	Winrich Kolbe	Kenneth Biller	September 4, 1995
2	3	"Projections"	48892.1	Jonathan Frakes	Brannon Braga	September 11, 1995
2	4	"Elogium"	48921.3	Winrich Kolbe	Story by: Jimmy Diggs and Steve J. Kay, Teleplay by: Kenneth Biller and Jeri Taylor	September 18, 1995
2	5	"Non Sequitur"	49011	David Livingston	Brannon Braga	September 25, 1995
2	6	"Twisted"	48945.8	Kim Friedman	Story by: Arnold Rudnick and Rich Hosek, Teleplay by: Kenneth Biller	October 2, 1995
2	7	"Parturition"	49068.5	Jonathan Frakes	Tom Szollosi	October 9, 1995
2	8	"Persistence of Vision"	49037.2	James L. Conway	Jeri Taylor	October 30, 1995
2	9	"Tattoo"	49211.5	Alexander Singer	Story by: Larry Brody, Teleplay by: Michael Piller	November 6, 1995
2	10	"Cold Fire"	49164.8	Cliff Bole	Story by: Anthony Williams, Teleplay by: Brannon Braga	November 13, 1995
2	11	"Maneuvers"	49208.5	David Livingston	Kenneth Biller	November 20, 1995

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
2	12	"Resistance"	49234.1	Winrich Kolbe	Story by: Michael Jan Friedman and Kevin J. Ryan, Teleplay by: Lisa Klink	November 27, 1995
2	13	"Prototype"	49270.9	Jonathan Frakes	Nicholas Corea	January 15, 1996
2	14	"Alliances"	49337.4	Les Landau	Jeri Taylor	January 22, 1996
2	15	"Threshold"	49373.4	Alexander Singer	Story by: Michael De Luca, Teleplay by: Brannon Braga	January 29, 1996
2	16	"Meld"	49380.5	Cliff Bole	Story by: Mike Sussman, Teleplay by: Michael Piller	February 5, 1996
2	17	"Dreadnought"	49447	LeVar Burton	Gary Holland	February 12, 1996
2	18	"Death Wish"	49301.2	James L. Conway	Story by: Shawn Piller, Teleplay by: Michael Piller	February 19, 1996
2	19	"Lifesigns"	49504.3	Cliff Bole	Kenneth Biller	February 26, 1996
2	20	"Investigations"	49485.2	Les Landau	Story by: Jeff Schnaufer and Ed Bond, Teleplay by: Jeri Taylor	March 13, 1996
2	21	"Deadlock"	49548.7	David Livingston	Brannon Braga	March 18, 1996
2	22	"Innocence"	49578.2	James L. Conway	Story by: Anthony Williams, Teleplay by: Lisa Klink	April 8, 1996
2	23	"The Thaw"	49610.3	Marvin V. Rush	Story by: Richard Gadas, Teleplay by: Joe Menosky	April 29, 1996
2	24	"Tuvix"	49655.2	Cliff Bole	Story by: Andrew Shepard Price and Mark Gaberman, Teleplay by: Kenneth Biller	May 6, 1996

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
2	25	"Resolutions"	49690.1	Alexander Singer	Jeri Taylor	May 13, 1996
2	26	"Basics, Part I"	49700.0	Winrich Kolbe	Michael Piller	May 20, 1996
3	1	"Basics, Part II"	50023.4	Winrich Kolbe	Michael Piller	September 4, 1996
3	2	"Flashback"	50126.4	David Livingston	Brannon Braga	September 11, 1996
3	3	"The Chute"	50156.2	Les Landau	Story by: Clayvon C. Harris, Teleplay by: Kenneth Biller	September 18, 1996
3	4	"The Swarm"	50252.3	Alexander Singer	Mike Sussman	September 25, 1996
3	5	"False Profits"	50074.3	Cliff Bole	Story by: George Brozak, Teleplay by: Joe Menosky	October 2, 1996
3	6	"Remember"	50203.1	Winrich Kolbe	Story by: Brannon Braga and Joe Menosky, Teleplay by: Lisa Klink	October 9, 1996
3	7	"Sacred Ground"	50063.2	Robert Duncan McNeill	Story by: Geo Cameron, Teleplay by: Lisa Klink	October 30, 1996
3	8	"Future's End, Part I"	Unknown	David Livingston	Brannon Braga and Joe Menosky	November 6, 1996
3	9	"Future's End, Part II"	50312.6	Cliff Bole	Brannon Braga and Joe Menosky	November 13, 1996
3	10	"Warlord"	50348.1	David Livingston	Story by: Andrew Shepard Price and Mark Gaberman, Teleplay by: Lisa Klink	November 20, 1996
3	11	"The Q and the Grey"	50384.2	Cliff Bole	Story by: Shawn Piller, Teleplay by: Kenneth Biller	November 27, 1996
3	12	"Macrocosm"	50425.1	Alexander Singer	Brannon Braga	December 11, 1996

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
3	13	"Fair Trade"	Unknown	Jesús Salvador Treviño	Story by: Ronald Wilkerson and Jean Louise Matthias, Teleplay by: André Bormanis	January 8, 1997
3	14	"Alter Ego"	50460.3	Robert Picardo	Joe Menosky	January 15, 1997
3	15	"Coda"	50518.6	Nancy Malone	Jeri Taylor	January 29, 1997
3	16	"Blood Fever"	50537.2	Andrew Robinson	Lisa Klink	February 5, 1997
3	17	"Unity"	50614.2	Robert Duncan McNeill	Kenneth Biller	February 12, 1997
3	18	"Darkling"	50693.2	Alexander Singer	Story by: Brannon Braga and Joe Menosky, Teleplay by: Joe Menosky	February 19, 1997
3	19	"Rise"	Unknown	Robert Scheerer	Story by: Jimmy Diggs, Teleplay by: Brannon Braga	February 26, 1997
3	20	"Favorite Son"	50732.4	Marvin V. Rush	Lisa Klink	March 19, 1997
3	21	"Before and After"	Unknown	Allan Kroeker	Kenneth Biller	April 9, 1997
3	22	"Real Life"	50836.2	Anson Williams	Story by: Harry 'Doc' Kloor, Teleplay by: Jeri Taylor	April 23, 1997
3	23	"Distant Origin"	Unknown	David Livingston	Brannon Braga and Joe Menosky	April 30, 1997
3	24	"Displaced"	50912.4	Allan Kroeker	Lisa Klink	May 7, 1997
3	25	"Worst Case Scenario"	50953.4	Alexander Singer	Kenneth Biller	May 14, 1997
3	26	"Scorpion, Part I"	50984.3	David Livingston	Brannon Braga and Joe Menosky	May 21, 1997
4	1	"Scorpion, Part II"	51003.7	Winrich Kolbe	Brannon Braga and Joe Menosky	September 3, 1997
4	2	"The Gift"	51008	Anson Williams	Joe Menosky	September 10, 1997

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
4	3	"Day of Honor"	Unknown	Jesús Salvador Treviño	Jeri Taylor	September 17, 1997
4	4	"Nemesis"	51082.4	Alexander Singer	Kenneth Biller	September 24, 1997
4	5	"Revulsion"	51186.2	Kenneth Biller	Lisa Klink	October 1, 1997
4	6	"The Raven"	Unknown	LeVar Burton	Story by: Bryan Fuller, Teleplay by: Bryan Fuller and Harry 'Doc' Kloor	October 8, 1997
4	7	"Scientific Method"	51244.3	David Livingston	Story by: Sherry Klein and Harry 'Doc' Kloor, Teleplay by: Lisa Klink	October 29, 1997
4	8	"Year of Hell, Part I"	51268.4	Allan Kroeker	Brannon Braga and Joe Menosky	November 5, 1997
4	9	"Year of Hell, Part II"	51425.4	Mike Vejar	Brannon Braga and Joe Menosky	November 12, 1997
4	10	"Random Thoughts"	51367.2	Alexander Singer	Kenneth Biller	November 19, 1997
4	11	"Concerning Flight"	51386.4	Jesús Salvador Treviño	Story by: Jimmy Diggs and Joe Menosky, Teleplay by: Joe Menosky	November 26, 1997
4	12	"Mortal Coil"	51449.2	Allan Kroeker	Bryan Fuller	December 17, 1997
4	13	"Waking Moments"	51471.3	Alexander Singer	André Bormanis	January 14, 1998
4	14	"Message in a Bottle"	51462	Nancy Malone	Story by: Rick Williams, Teleplay by: Lisa Klink	January 21, 1998
4	15	"Hunters"	51501.4	David Livingston	Jeri Taylor	February 11, 1998
4	16	"Prey"	51652.3	Allan Eastman	Brannon Braga	February 18, 1998
4	17	"Retrospect"	51658.2	Jesús Salvador Treviño	Story by: Andrew Shepard Price and Mark Gaberman, Teleplay by: Bryan Fuller and Lisa Klink	February 25, 1998

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
4	18	"The Killing Game, part I"	51715.2	David Livingston	Brannon Braga and Joe Menosky	March 4, 1998
4	19	"The Killing Game, part II"	51715.2	David Livingston	Brannon Braga and Joe Menosky	March 4, 1998
4	20	"Vis à Vis"	51762.4	Jesús Salvador Treviño	Robert J. Doherty	April 8, 1998
4	21	"The Omega Directive"	51781.2	Victor Lobl	Story by: Jimmy Diggs and Steve J. Kay, Teleplay by: Lisa Klink	April 15, 1998
4	22	"Unforgettable"	51813.4	Andrew Robinson	Greg Elliot and Michael Perricone	April 22, 1998
4	23	"Living Witness"	Unknown	Tim Russ	Story by: Brannon Braga, Teleplay by: Bryan Fuller, Brannon Braga and Joe Menosky	April 29, 1998
4	24	"Demon"	Unknown	Anson Williams	Story by: André Bormanis, Teleplay by: Kenneth Biller	May 6, 1998
4	25	"One"	51929.3	Kenneth Biller	Jeri Taylor	May 13, 1998
4	26	"Hope and Fear"	51978.2	Winrich Kolbe	Story by: Rick Berman, Brannon Braga and Joe Menosky, Teleplay by: Brannon Braga and Joe Menosky	May 20, 1998
5	1	"Night"	52081.2	David Livingston	Brannon Braga and Joe Menosky	October 14, 1998
5	2	"Drone"	Unknown	Les Landau	Story by: Bryan Fuller and Harry 'Doc' Kloor, Teleplay by: Bryan Fuller, Brannon Braga and Joe Menosky	October 21, 1998

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
5	3	"Extreme Risk"	Unknown	Cliff Bole	Kenneth Biller	October 28, 1998
5	4	"In the Flesh"	52136.4	David Livingston	Nick Sagan	November 4, 1998
5	5	"Once Upon a Time"	Unknown	John Kretchmer	Michael Taylor	November 11, 1998
5	6	"Timeless"	52143.6	LeVar Burton	Story by: Rick Berman and Brannon Braga and Joe Menosky, Teleplay by: Brannon Braga and Joe Menosky	November 18, 1998
5	7	"Infinite Regress"	52356.2	David Livingston	Story by: Robert J. Doherty and Jimmy Diggs, Teleplay by: Robert J. Doherty	November 25, 1998
5	8	"Nothing Human"	Unknown	David Livingston	Jeri Taylor	December 2, 1998
5	9	"Thirty Days"	52179.4	Winrich Kolbe	Story by: Scott Miller, Teleplay by: Kenneth Biller	December 9, 1998
5	10	"Counterpoint"	Unknown	Les Landau	Michael Taylor	December 16, 1998
5	11	"Latent Image"	Unknown	Mike Vejar	Story by: Eileen Connors, Brannon Braga and Joe Menosky, Teleplay by: Joe Menosky	January 20, 1999
5	12	"Bride of Chaotica!"	Unknown	Allan Kroeker	Story by: Bryan Fuller, Teleplay by: Bryan Fuller and Michael Taylor	January 27, 1999
5	13	"Gravity"	52438.9	Terry Windell	Story by: Jimmy Diggs, Bryan Fuller and Nick Sagan, Teleplay by: Nick Sagan and Bryan Fuller	February 3, 1999

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
5	14	"Bliss"	52542.3	Cliff Bole	Story by: Bill Prady, Teleplay by: Robert J. Doherty	February 10, 1999
5	15	"Dark Frontier"	52619.2	Cliff Bole	Brannon Braga and Joe Menosky	February 17, 1999
	16			Terry Windell		
5	17	"The Disease"	Unknown	David Livingston	Story by: Kenneth Biller, Teleplay by: Michael Taylor	February 24, 1999
5	18	"Course: Oblivion"	52586.3	Anson Williams	Story by: Bryan Fuller, Teleplay by: Bryan Fuller and Nick Sagan	March 3, 1999
5	19	"The Fight"	Unknown	Winrich Kolbe	Story by: Michael Taylor, Teleplay by: Joe Menosky	March 24, 1999
5	20	"Think Tank"	Unknown	Terrence O'Hara	Story by: Rick Berman and Brannon Braga, Teleplay by: Michael Taylor	March 31, 1999
5	21	"Juggernaut"	Unknown	Allan Kroeker	Story by: Bryan Fuller, Teleplay by: Bryan Fuller, Nick Sagan and Kenneth Biller	April 26, 1999
5	22	"Someone to Watch Over Me"	52647	Robert Duncan McNeill	Story by: Brannon Braga, Teleplay by: Michael Taylor	April 28, 1999
5	23	"11:59"	Unknown	David Livingston	Story by: Brannon Braga and Joe Menosky, Teleplay by: Joe Menosky	May 5, 1999
5	24	"Relativity"	52861.274	Allan Eastman	Story by: Nick Sagan, Teleplay by: Bryan Fuller, Nick Sagan and Michael Taylor	May 12, 1999

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
5	25	"Warhead"	Unknown	John Kretchmer	Story by: Brannon Braga, Teleplay by: Michael Taylor and Kenneth Biller	May 19, 1999
5	26	"Equinox, Part I"	Unknown	David Livingston	Story by: Rick Berman, Brannon Braga and Joe Menosky, Teleplay by: Brannon Braga and Joe Menosky	May 26, 1999
6	1	"Equinox, Part II"	Unknown	David Livingston	Story by: Rick Berman, Brannon Bragaand Joe Menosky, Teleplay by: Brannon Braga and Joe Menosky	September 22, 1999
6	2	"Survival Instinct"	53049.2	Terry Windell	Ronald D. Moore	September 29, 1999
6	3	"Barge of the Dead"	Unknown	Mike Vejar	Story by: Ronald D. Moore and Bryan Fuller, Teleplay by: Bryan Fuller	October 6, 1999
6	4	"Tinker, Tenor, Doctor, Spy"	Unknown	John Bruno	Story by: Bill Vallely, Teleplay by: Joe Menosky	October 13, 1999
6	5	"Alice"	Unknown	David Livingston	Story by: Juliann deLayne, Teleplay by: Bryan Fuller and Michael Taylor	October 20, 1999
6	6	"Riddles"	53263.2	Roxann Dawson	Story by: André Bormanis, Teleplay by: Robert J. Doherty	November 3, 1999
6	7	"Dragon's Teeth"	53167.9	Winrich Kolbe	Story by: Michael Taylor, Teleplay by: Michael Taylor, Brannon Braga and Joe Menosky	November 10, 1999

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
6	8	"One Small Step"	53292.7	Robert Picardo	Story by: Mike Wollaeger and Jessica Scott, Teleplay by: Mike Wollaeger, Jessica Scott, Bryan Fuller and Michael Taylor	November 17, 1999
6	9	"The Voyager Conspiracy"	Unknown	Terry Windell	Joe Menosky	November 24, 1999
6	10	"Pathfinder"	Unknown	Mike Vejar	Story by: David Zabel, Teleplay by: David Zabel and Kenneth Biller	December 1, 1999
6	11	"Fair Haven"	Unknown	Allan Kroeker	Robin Burger	January 12, 2000
6	12	"Blink of an Eye"	Unknown	Gabrielle Beaumont	Story by: Michael Taylor, Teleplay by: Joe Menosky	January 19, 2000
6	13	"Virtuoso"	53556.4	Les Landau	Story by: Raf Green, Teleplay by: Raf Green and Kenneth Biller	January 26, 2000
6	14	"Memorial"	Unknown	Allan Kroeker	Story by: Brannon Braga, Teleplay by: Robin Burger	February 2, 2000
6	15	"Tsunkatse"	53447.2	Mike Vejar	Story by: Gannon Kenney, Teleplay by: Robert J. Doherty	February 9, 2000
6	16	"Collective"	Unknown	Allison Liddi	Story by: Andrew Shepard Price and Mark Gaberman, Teleplay by: Michael Taylor	February 16, 2000
6	17	"Spirit Folk"	Unknown	David Livingston	Bryan Fuller	February 23, 2000
6	18	"Ashes to Ashes"	53679.4	Terry Windell	Story by: Ronald Wilkerson, Teleplay by: Robert J. Doherty	March 1, 2000

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
6	19	"Child's Play"	Unknown	Mike Vejar	Story by: Paul Brown, Teleplay by: Raf Green	March 8, 2000
6	20	"Good Shepherd"	53753.2	Winrich Kolbe	Story by: Dianna Gitto, Teleplay by: Dianna Gitto and Joe Menosky	March 15, 2000
6	21	"Live Fast and Prosper"	53849.2	LeVar Burton	Robin Burger	April 19, 2000
6	22	"Muse"	53896	Mike Vejar	Joe Menosky	April 26, 2000
6	23	"Fury"	Unknown	John Bruno	Story by: Rick Berman and Brannon Braga, Teleplay by: Bryan Fuller and Michael Taylor	May 3, 2000
6	24	"Life Line"	Unknown	Terry Windell	Story by: John Bruno and Robert Picardo, Teleplay by: Robert J. Doherty, Raf Green and Brannon Braga	May 10, 2000
6	25	"The Haunting of Deck Twelve"	Unknown	David Livingston	Story by: Mike Sussman, Teleplay by: Mike Sussman, Kenneth Biller and Bryan Fuller	May 17, 2000
6	26	"Unimatrix Zero, Part I"	Unknown	Allan Kroeker	Story by: Mike Sussman, Teleplay by: Brannon Braga and Joe Menosky	May 24, 2000
7	1	"Unimatrix Zero, Part II"	54014.4	Mike Vejar	Story by: Mike Sussman, Brannon Bragaand Joe Menosky, Teleplay by: Brannon Braga and Joe Menosky	October 4, 2000

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
7	2	"Imperfection"	54058.6	David Livingston	Story by: André Bormanis, Teleplay by: Carleton Eastlake and Robert J. Doherty	October 11, 2000
7	3	"Drive"	54090.4	Winrich Kolbe	Michael Taylor	October 18, 2000
7	4	"Repression"	54129.4	Winrich Kolbe	Story by: Kenneth Biller, Teleplay by: Mark Haskell Smith	October 25, 2000
7	5	"Critical Care"	Unknown	Terry Windell	Story by: Kenneth Biller and Robert J. Doherty, Teleplay by: James Kahn	November 1, 2000
7	6	"Inside Man"	54208.3	Allan Kroeker	Robert J. Doherty	November 8, 2000
7	7	"Body and Soul"	54238.3	Robert Duncan McNeill	Story by: Michael Taylor, Teleplay by: Eric Morris, Phyllis Strong and Mike Sussman	November 15, 2000
7	8	"Nightingale"	54274.7	LeVar Burton	Story by: Robert Lederman and Dave Long, Teleplay by: André Bormanis	November 22, 2000
7	9	"Flesh and Blood"	54337.5	Mike Vejar	Story by: Jack Monaco, Bryan Fuller and Raf Green, Teleplay by: Bryan Fuller	November 29, 2000
	10			David Livingston	Story by: Bryan Fuller and Raf Green, Teleplay by: Raf Green and Kenneth Biller	

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
7	11	"Shattered"	Unknown	Terry Windell	Story by: Mike Sussman and Michael Taylor, Teleplay by: Michael Taylor	January 17, 2001
7	12	"Lineage"	54452.6	Peter Lauritson	James Kahn	January 24, 2001
7	13	"Repentance"	Unknown	Mike Vejar	Story by: Mike Sussman and Robert J. Doherty, Teleplay by: Robert J. Doherty	January 31, 2001
7	14	"Prophecy"	54518.2	Terry Windell	Story by: Larry Nemecek, J. Kelley Burke, Raf Green and Kenneth Biller, Teleplay by: Mike Sussman and Phyllis Strong	February 7, 2001
7	15	"The Void"	54553.4	Mike Vejar	Story by: Raf Green and Kenneth Biller, Teleplay by: Raf Green and James Kahn	February 14, 2001
7	16	"Workforce, Part I"	54584.3	Allan Kroeker	Kenneth Biller and Bryan Fuller	February 21, 2001
7	17	"Workforce, Part II"	54622.4	Roxann Dawson	Story by: Kenneth Biller and Bryan Fuller, Teleplay by: Kenneth Biller and Michael Taylor	February 28, 2001
7	18	"Human Error"	Unknown	Allan Kroeker	Story by: André Bormanis and Kenneth Biller, Teleplay by: Brannon Braga and André Bormanis	March 7, 2001

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
7	19	"Q2"	54704.5	LeVar Burton	Story by: Kenneth Biller, Teleplay by: Robert J. Doherty	April 11, 2001
7	20	"Author, Author"	54732.3	David Livingston	Story by: Brannon Braga, Teleplay by: Phyllis Strong and Mike Sussman	April 18, 2001
7	21	"Friendship One"	54775.4	Mike Vejar	Michael Taylor and Bryan Fuller	April 25, 2001
7	22	"Natural Law"	54827.7	Terry Windell	Story by: Kenneth Biller and James Kahn, Teleplay by: James Kahn	May 2, 2001
7	23	"Homestead"	54868.6	LeVar Burton	Raf Green	May 9, 2001
7	24	"Renaissance Man"	54890.7	Mike Vejar	Story by: Andrew Shepard Price and Mark Gaberman, Teleplay by: Phyllis Strong and Mike Sussman	May 16, 2001
7	25 & 26	"Endgame"	54973.4	Allan Kroeker	Story by: Rick Berman, Kenneth Biller and Brannon Braga, Teleplay by: Kenneth Biller and Robert J. Doherty	May 23, 2001

[a]This table lists writers as credited on the original air date

References

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Appendix 6

Star Trek: Enterprise
Season 1, 2001–2002 to Season 5, 2004–2005

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	1 & 2	"Broken Bow"	April 16, 2151	James L. Conway	Rick Berman & Brannon Braga	September 26, 2001
1	3	"Fight or Flight"	May 6, 2151	Allan Kroeker	Rick Berman & Brannon Braga	October 3, 2001
1	4	"Strange New World"	Unknown	David Livingston	Story by: Rick Berman & Brannon Braga, Teleplay by: Mike Sussman & Phyllis Strong	October 10, 2001
1	5	"Unexpected"	Unknown	Mike Vejar	Rick Berman & Brannon Braga	October 17, 2001
1	6	"Terra Nova"	Unknown	LeVar Burton	Story by: Rick Berman & Brannon Braga, Teleplay by: Antoinette Stella	October 24, 2001
1	7	"The Andorian Incident"	June 19, 2151	Roxann Dawson	Story by: Rick Berman, Brannon Braga & Fred Dekker, Teleplay by: Fred Dekker	October 31, 2001
1	8	"Breaking the Ice"	Unknown	Terry Windell	Andre Jaquemetton & Maria Jaquemetton	November 7, 2001
1	9	"Civilization"	July 31, 2151	Mike Vejar	Mike Sussman & Phyllis Strong	November 14, 2001
1	10	"Fortunate Son"	Unknown	LeVar Burton	James Duff	November 21, 2001
1	11	"Cold Front"	September 9, 2151	Robert Duncan McNeill	Stephen Beck & Tim Finch	November 28, 2001
1	12	"Silent Enemy"	September 1, 2151	Winrich Kolbe	André Bormanis	January 16, 2002
1	13	"Dear Doctor"	Unknown	James A. Contner	Andre Jaquemetton & Maria Jaquemetton	January 23, 2002

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	14	"Sleeping Dogs"	Unknown	Les Landau	Fred Dekker	January 30, 2002
1	15	"Shadows of P'Jem"	Unknown	Mike Vejar	Story by: Rick Berman & Brannon Braga, Teleplay by: Mike Sussman & Phyllis Strong	February 6, 2002
1	16	"Shuttlepod One"	November 9, 2151	David Livingston	Rick Berman & Brannon Braga	February 13, 2002
1	17	"Fusion"	Unknown	Rob Heddon	Story by: Rick Berman & Brannon Braga, Teleplay by: Phyllis Strong & Mike Sussman	February 27, 2002
1	18	"Rogue Planet"	Unknown	Allan Kroeker	Story by: Rick Berman, Brannon Braga & Chris Black, Teleplay by: Chris Black	March 20, 2002
1	19	"Acquisition"	Unknown	James Whitmore, Jr.	Story by: Rick Berman & Brannon Braga, Teleplay by: Maria Jaquemetton & Andre Jaquemetton	March 27, 2002
1	20	"Oasis"	Unknown	Jim Charleston	Story by: Rick Berman, Brannon Braga & Stephen Beck, Teleplay by: Stephen Beck	April 3, 2002
1	21	"Detained"	Unknown	David Livingston	Story by: Rick Berman & Brannon Braga, Teleplay by: Mike Sussman & Phyllis Strong	April 24, 2002

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
1	22	"Vox Sola"	Unknown	Roxann Dawson	Story by: Rick Berman, Brannon Braga & Fred Dekker, Teleplay by: Fred Dekker	May 1, 2002
1	23	"Fallen Hero"	February 9, 2152	Patrick Norris	Story by: Rick Berman, Brannon Braga & Chris Black, Teleplay by: Alan Cross	May 8, 2002
1	24	"Desert Crossing"	February 12, 2152	David Straiton	Story by: Rick Berman, Brannon Braga & André Bormanis, Teleplay by: André Bormanis	May 8, 2002
1	25	"Two Days and Two Nights"	February 18, 2152	Michael Dorn	Story by: Rick Berman & Brannon Braga, Teleplay by: Chris Black	May 15, 2002
1	26	"Shockwave, Part I"	Unknown	Allan Kroeker	Rick Berman & Brannon Braga	May 22, 2002
2	1	"Shockwave, Part II"	Unknown	Allan Kroeker	Rick Berman & Brannon Braga	September 18, 2002
2	2	"Carbon Creek"	April 12, 2152	James A. Contner	Story by: *Rick Berman, Brannon Braga & Dan O'Shannon*, Teleplay by: *Chris Black*	September 25, 2002
2	3	"Minefield"	Unknown	James A. Contner	John Shiban	October 2, 2002
2	4	"Dead Stop"	Unknown	Roxann Dawson	Mike Sussman & Phyllis Strong	October 9, 2002
2	5	"A Night In Sickbay"	Unknown	David Straiton	Rick Berman & Brannon Braga	October 16, 2002
2	6	"Marauders"	Unknown	Mike Vejar	Story by: *Rick Berman & Brannon Braga*, Teleplay by: *David Wilcox*	October 30, 2002

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
2	7	"The Seventh"	Unknown	David Livingston	Rick Berman & Brannon Braga	November 6, 2002
2	8	"The Communicator"	Unknown	James A. Contner	Story by: *Rick Berman & Brannon Braga*, Teleplay by: *André Bormanis*	November 13, 2002
2	9	"Singularity"	August 14, 2152	Patrick Norris	Chris Black	November 20, 2002
2	10	"Vanishing Point"	Unknown	David Straiton	Rick Berman & Brannon Braga	November 27, 2002
2	11	"Precious Cargo"	September 12, 2152	David Livingston	Story by: *Rick Berman & Brannon Braga*, Teleplay by: *David A. Goodman*	December 11, 2002
2	12	"The Catwalk"	September 18, 2152	Mike Vejar	Mike Sussman & Phyllis Strong	December 18, 2002
2	13	"Dawn"	Unknown	Roxann Dawson	John Shiban	January 8, 2003
2	14	"Stigma"	Unknown	David Livingston	Rick Berman & Brannon Braga	February 5, 2003
2	15	"Cease Fire"	Unknown	David Straiton	Chris Black	February 12, 2003
2	15	"Cease Fire"	Unknown	David Straiton	Chris Black	February 12, 2003
2	16	"Future Tense"	Unknown	James Whitmore, Jr.	Mike Sussman & Phyllis Strong	February 19, 2003
2	17	"Canamar"	Unknown	Allan Kroeker	John Shiban	February 26, 2003
2	18	"The Crossing"	Unknown	David Livingston	Story by: Rick Berman, Brannon Braga and André Bormanis, Teleplay by: Rick Berman & Brannon Braga	April 2, 2003
2	19	"Judgment"	Unknown	James L. Conway	Story by: Taylor Elmore and David A. Goodman, Teleplay by: David A. Goodman	April 9, 2003

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
2	20	"Horizon"	January 10, 2153	James A. Contner	André Bormanis	April 16, 2003
2	21	"The Breach"	Unknown	Robert Duncan McNeill	Story by: Daniel McCarthy, Teleplay by: Chris Black & John Shiban	April 23, 2003
2	22	"Cogenitor"	Unknown	LeVar Burton	Rick Berman & Brannon Braga	April 30, 2003
2	23	"Regeneration"	March 1, 2153	David Livingston	Mike Sussman & Phyllis Strong	May 7, 2003
2	24	"First Flight"	Unknown	LeVar Burton	John Shiban & Chris Black	May 14, 2003
2	25	"Bounty"	March 21, 2153	Roxann Dawson	Story by: Rick Berman & Brannon Braga, Teleplay by: Hans Tobeason, Mike Sussman & Phyllis Strong	May 14, 2003
2	26	"The Expanse"	April 24, 2153	Allan Kroeker	Rick Berman & Brannon Braga	May 21, 2003
3	1	"The Xindi"	Unknown	Allan Kroeker	Rick Berman & Brannon Braga	September 10, 2003
3	2	"Anomaly"	Unknown	David Straiton	Mike Sussman	September 17, 2003
3	3	"Extinction"	Unknown	LeVar Burton	André Bormanis	September 24, 2003
3	4	"Rajiin"	Unknown	Mike Vejar	Story by: Paul Brown & Brent V. Friedman, Teleplay by: Brent V. Friedman & Chris Black	October 1, 2003
3	5	"Impulse"	Unknown	David Livingston	Story by: *Jonathan Fernandez & Terry Matalas*, Teleplay by: *Jonathan Fernandez*	October 8, 2003
3	6	"Exile"	Unknown	Roxann Dawson	Phyllis Strong	October 15, 2003

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
3	7	"The Shipment"	Unknown	David Straiton	Chris Black & Brent V. Friedman	October 29, 2003
3	8	"Twilight"	Unknown	Robert Duncan McNeill	Mike Sussman	November 5, 2003
3	9	"North Star"	Unknown	David Straiton	David A. Goodman	November 12, 2003
3	10	"Similitude"	Unknown	LeVar Burton	Manny Coto	November 19, 2003
3	11	"Carpenter Street"	Unknown	Mike Vejar	Rick Berman & Brannon Braga	November 26, 2003
3	12	"Chosen Realm"	Unknown	Roxann Dawson	Manny Coto	January 14, 2004
3	13	"Proving Ground"	December 6, 2153	David Livingston	Chris Black	January 21, 2004
3	14	"Stratagem"	December 12, 2153	Mike Vejar	Story by: Terry Matalas, Teleplay by: Mike Sussman	February 4, 2004
3	15	"Harbinger"	December 27, 2153	David Livingston	Story by: Rick Berman & Brannon Braga, Teleplay by: Manny Coto	February 11, 2004
3	16	"Doctor's Orders"	Unknown	Roxann Dawson	Chris Black	February 18, 2004
3	17	"Hatchery"	January 8, 2154	Michael Grossman	Story by: André Bormanis & Mike Sussman, Teleplay by: André Bormanis	February 25, 2004
3	18	"Azati Prime"	Unknown	Allan Kroeker	Story by: Rick Berman, Brannon Braga & Manny Coto, Teleplay by: Manny Coto	March 3, 2004
3	19	"Damage"	Unknown	James L. Conway	Phyllis Strong	April 21, 2004
3	20	"The Forgotten"	Unknown	LeVar Burton	Chris Black & David A. Goodman	April 28, 2004
3	21	"E²"	Unknown	Roxann Dawson	Mike Sussman	May 5, 2004
3	22	"The Council"	February 12, 2154	David Livingston	Manny Coto	May 12, 2004

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
3	23	"Countdown"	February 13, 2154	Robert Duncan McNeill	André Bormanis & Chris Black	May 19, 2004
3	24	"Zero Hour"	February 14, 2154	Allan Kroeker	Rick Berman & Brannon Braga	May 26, 2004
4	1	"Storm Front, Part I"	Unknown	Allan Kroeker	Manny Coto	October 8, 2004
4	2	"Storm Front, Part II"	Unknown	Allan Kroeker	Manny Coto	October 15, 2004
4	3	"Home"	Unknown	Allan Kroeker	Mike Sussman	October 22, 2004
4	4	"Borderland"	May 17, 2154	David Livingston	Ken LaZebnik	October 29, 2004
4	5	"Cold Station 12"	Unknown	Mike Vejar	Michael Bryant	November 5, 2004
4	6	"The Augments"	May 27, 2154	LeVar Burton	Mike Sussman	November 12, 2004
4	7	"The Forge"	Unknown	Michael Grossman	Garfield Reeves-Stevens & Judith Reeves-Stevens	November 19, 2004
4	8	"Awakening"	Unknown	Roxann Dawson	André Bormanis	November 26, 2004
4	9	"Kir'Shara"	Unknown	David Livingston	Mike Sussman	December 3, 2004
4	10	"Daedalus"	Unknown	David Straiton	Michael Bryant & Ken LaZebnik	January 14, 2005
4	11	"Observer Effect"	Unknown	Mike Vejar	Garfield Reeves-Stevens & Judith Reeves-Stevens	January 21, 2005
4	12	"Babel One"	November 12, 2154	David Straiton	Mike Sussman & André Bormanis	January 28, 2005
4	13	"United"	November 15, 2154	David Livingston	Story by: Manny Coto, Teleplay by: Judith Reeves-Stevens & Garfield Reeves-Stevens	February 4, 2005
4	14	"The Aenar"	Unknown	Mike Vejar	Story by: Manny Coto, Teleplay by: André Bormanis	February 11, 2005

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Season #	Episode #	Title	Stardate	Director	Credited writer(s)[a]	Original air date
4	15	"Affliction"	November 27, 2154	Michael Grossman	Story by: Manny Coto, Teleplay by: Mike Sussman	February 18, 2005
4	16	"Divergence"	Unknown	David Barrett	Garfield Reeves-Stevens & Judith Reeves-Stevens	February 25, 2005
4	17	"Bound"	December 27, 2154	Allan Kroeker	Manny Coto	April 15, 2005
4	18	"In a Mirror, Darkly, Part I"	January 13, 2155	James L. Conway	Mike Sussman	April 22, 2005
4	19	"In a Mirror, Darkly, Part II"	January 18, 2155	Marvin V. Rush	Story by: Manny Coto, Teleplay by: Mike Sussman	April 29, 2005
4	20	"Demons"	January 19, 2155	LeVar Burton	Manny Coto	May 6, 2005
4	21	"Terra Prime"	January 22, 2155	Marvin V. Rush	Story by: Judith Reeves-Stevens, Garfield Reeves-Stevens & Andre Bormanis, Teleplay by: Judith Reeves-Stevens, Garfield Reeves-Stevens & Manny Coto	May 13, 2005
4	22	"These Are the Voyages..."	47457.1[b]	Allan Kroeker	Rick Berman & Brannon Braga	May 13, 2005

[a]This table lists writers as credited on the original air date
[b]This might be considered a spoiler

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Appendix 7

Star Trek: Discovery (At the time of writing, the first season has aired, and the series has already been renewed for a second season.)

Season 1, 2017–2018

Season #	Episode #	Title	Stardate	Director	Credited writer(s)	Original air date
1	1	"The Vulcan Hello"	1207.3	David Semel	Story by: Bryan Fuller & Alex Kurtzman, Teleplay by: Akiva Goldsman & Bryan Fuller	September 24, 2017[a]
1	2	"Battle at the Binary Stars"	1207.3	Adam Kane	Story by: Bryan Fuller, Teleplay by: Gretchen J. Berg & Aaron Harberts	September 24, 2017
1	3	"Context Is for Kings"	Unknown	Akiva Goldsman	Story by: Bryan Fuller & Gretchen J. Berg & Aaron Harberts, Teleplay by: Gretchen J. Berg & Aaron Harberts & Craig Sweeny	October 1, 2017
1	4	"The Butcher's Knife Cares Not for the Lamb's Cry"	Unknown	Olatunde Osunsanmi	Jesse Alexander & Aron Eli Coleite	October 8, 2017
1	5	"Choose Your Pain"	Unknown	Lee Rose	Story by: Gretchen J. Berg & Aaron Harberts & Kemp Powers, Teleplay by: Kemp Powers	October 15, 2017
1	6	"Lethe"	Unknown	Douglas Aarniokoski	Joe Menosky & Ted Sullivan	October 22, 2017
1	7	"Magic to Make the Sanest Man Go Mad"	2136.8–2137.2	David M. Barrett	Aron Eli Coleite & Jesse Alexander	October 29, 2017
1	8	"Si Vis Pacem, Para Bellum"	1308.9	John S. Scott	Kirsten Beyer	November 5, 2017

(continued)

Season #	Episode #	Title	Stardate	Director	Credited writer(s)	Original air date
1	9	"Into the Forest I Go"	Unknown	Chris Byrne	Bo Yeon Kim & Erika Lippoldt	November 12, 2017
1	10	"Despite Yourself"	Unknown	Jonathan Frakes	Sean Cochran	January 7, 2018
1	11	"The Wolf Inside"	Unknown	T. J. Scott	Lisa Randolph	January 14, 2018
1	12	"Vaulting Ambition"	Unknown	Hanelle M. Culpepper	Jordan Nardino	January 21, 2018
1	13	"What's Past Is Prologue"	1834.2	Olatunde Osunsanmi	Ted Sullivan	January 28, 2018
1	14	"The War Without, The War Within"	Unknown	David Solomon	Lisa Randolph	February 4, 2018
1	15	"Will You Take My Hand?"	Unknown	Akiva Goldsman	Story by: Akiva Goldsman & Gretchen J. Berg & Aaron Harberts, Teleplay: by Gretchen J. Berg & Aaron Harberts	February 12, 2018

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Appendix 8

Star Trek Films (The *Star Trek* film franchise can be seen as two series. The first began in 1979 with the cast of the original television series (TOS) and crossed over with the cast of *Star Trek: The Next Generation* (TNG) in 1994s *Generations*. The TNG cast then appeared in several of their own films. In 2013, the series was rebooted with a new cast playing the characters from TOS, albeit in an alternate timeline.)

Original Series, 1979–2002 to Reboot, 2009–2016

Film #	Title	Stardate	Director	Credited Writer(s)	Original Release Date
1	Star Trek: The Motion Picture	7410.2	Robert Wise	Story: Alan Dean Foster, Screenplay: Harold Livingston	1979
2	Star Trek II: The Wrath of Khan	8130.3	Nicholas Meyer	Story by: Harve Bennett, Jack B. Sowards, Screenplay: Jack B. Sowards	1982
3	Star Trek III: The Search For Spock	8210.3	Leonard Nimoy	Harve Bennett	1984
4	Star Trek IV:	8390	Leonard Nimoy	Story by: Harve Bennett and Leonard Nimoy, Screenplay: Steve Meerson, Peter Krikes, Nicholas Meyer, Harve Bennett	1986
5	Star Trek V: The Final Frontier	8454.1	William Shatner	Story by: William Shatner, Harve Bennett, David Loughery, Screenplay: David Laughery	1989
6	Star Trek VI: The Undiscovered Country	9529.1	Nicholas Meyer	Story by: Leonard Nimoy, Lawrence Konner, Mark Rosenthal, Screenplay: Nicholas Meyer, Denny Martin Flinn	1991
7	Star Trek: Generations	9715.5	David Carson	Story by: Rick Berman, Ronald D. Moore, Brannon Braga, Screenplay: Ronald D. Moore, Brannon Braga	1994
8	Star Trek: First Contact	50893.5	Jonathan Frakes	Story by: Rick Berman, Brannon Braga, Ronald D. Moore, Screenplay: Brannon Braga, Ronald D. Moore	1996
9	Star Trek: Insurrection	Unknown	Jonathan Frakes	Story by Rick Berman and Michael Piller, Screenplay: Michael Piller	1998
10	Star Trek: Nemesis	56844.9	Stuart Baird	Story by: John Logan, Rick Berman, Brent Spiner, Screenplay: John Logan	2002
11	Star Trek	2258.42	J. J. Abrams	Roberto Orci, Alex Kurtzman	2009
12	Into Darkness	2259.55	J. J. Abrams	Roberto Orci, Alex Kurtzman, Damon Lindelof	2013
13	Beyond	2263.2	Justin Lin	Simon Pegg, Doug Jung	2016

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