The Softer Side of *Dune*: The Impact of the Social Sciences on World-Building[1]

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ABSTRACT: Looking at *Dune* as one of the bridges between the 'hard' science fiction of the 1950s and the 'soft' science fiction of the New Wave, it is significant that author Frank Herbert chooses to create a world where technological prowess is not the focus, where the culture is still haunted by the Butlerian Jihad, when machines were used to enslave humankind. This historical context justifies an attitude of suspicion and fear toward technology, which then enables Herbert to concentrate on making a universe centered on the development of the human mind and body. In the Imperium, then, new orders of enhanced humans seem necessary and natural, including the Mentats, with their logical, computer-like functions; and the Spacing Guild, with its enhanced Navigators who alone can guide ships traveling through space. Furthermore, having already set up suspicion about the stereotypically male-dominated realm of technology, Herbert is perhaps better positioned to realistically depict the most powerful order in the novel, the Bene Gesserit Sisterhood, as an all-female one, whose 'soft' power over society is significant, from the gom jabbar test to Truthsaying to the Voice. Yet Herbert still places all of these new orders in a familiar feudal governing structure with emperors and family clans to maintain a link with real-world institutions. Ultimately, Herbert relies heavily on the social sciences to create a world focused on the development of the human mind and body rather than technology, and proves that a focus on the human offers a tremendous opportunity for building an interesting and believable universe.

KEYWORDS: Dune, Frank Herbert, science fiction, world-building, social sciences

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The success of Frank Herbert's *Dune* (1965) as a world-building novel challenges the idea that there is a preferable type of science fiction within the much-debated "hard" to "soft" spectrum. Instead, it suggests that a variety of sciences can be blended to become the bedrock for an interesting and believable world. Science fiction scholar James Gunn postulates that *Dune* is difficult for the reader to categorize because it is a mixture of hard and soft sciences —"the ecology is hard, the anthropology and the psychic abilities are soft"— but that "[t]his may be the reason for its success" because readers can enjoy different kinds of richness (Gunn, p. 79). Yet the lack of criticism on the novel's world-building features has left the complexities of its categorization largely unexplored. The breadth of sciences present in the novel attests to an extended process of study on the part of the author, who, according to his biographers Timothy O'Reilly and son Brian Herbert, spent years researching "works of history […], religion, psychology, ESP, dry land ecology, geology, linguistics, anthropology, botany, [and] navigation" (B. Herbert, p. 164). Unlike science fiction writers who focus on exploring a single science in detail, Herbert brings a wide range "together in one consistent and entertaining fictional world" while still pursuing a high level of verisimilitude (O'Reilly, p. 13). Although he uses a mixture of sciences, Herbert relies heavily on the social sciences to create a world focused on the development of the human mind and body rather than technology. He positions the fictional historical context of the Butlerian Jihad —when humans revolted against machines after having been enslaved by them— as justification for the necessity of new orders of enhanced humans. Such orders include the Spacing Guild, with its navigators who guide spaceships; Mentats, with their logical, computer-like functions; and the Bene Gesserit, with its women skilled in perception, nerve and muscle control, and hand-to-hand combat. Herbert draws on real-world history to help maintain plausibility, placing all of these orders in a familiar feudal governing structure with emperors and family clans. Ultimately, by extrapolating from contemporary understandings of various social sciences to develop the world in *Dune*, Herbert proves that a focus on the human offers a tremendous opportunity for building an interesting and believable universe.

The classification of science fiction as either "hard" or "soft" can be a point of contention, but these categories represent a useful way in which to view *Dune* as a bridge between them that showcases the value in focusing on sciences concerned with the human. The terms "hard" and "soft" reflect a division in the real-world scientific community, which then appears in criticism and valuation of texts in the science fiction genre as well. Although the value judgements regarding these categories may vary, on the whole, the so-called hard-pure knowledge in fields like physics "tends to carry high prestige" and have more privileged status than the soft or applied knowledge in the social sciences and humanities, which are more concerned with human society and culture (Becher and Trowler, pp. 177, 192). In Gunn's definition, hard science fiction involves a story turning "around a change in the environment that can be understood only scientifically and generally through what are known as the hard sciences, usually the laboratory sciences such as chemistry, physics, and biology, and the observational sciences such as astronomy, geology, and geography" (Gunn, p. 74). In *The Encyclopedia of Science Fiction* (1999), Peter Nicholls includes computers, physics, space flight, spaceships, and technology in the category of hard science fiction, noting that it

should not ignore known scientific principles but that leeway is given for some aspects like ESP and faster-than-light travel ("Hard SF"). He classifies soft science fiction as stories that deal primarily with social sciences including anthropology, ecology, linguistics, perception, psychology, and sociology ("Hard SF", "Soft Sciences"). In *Dune*, there are noticeable aspects of hard science, particularly the attempt to realistically portray a desert planet and the creatures that might live there, as well as the adaptations humans might undergo for it to be inhabitable. Spaceships and space flight are also features of this universe, along with smaller pieces of technology like the stillsuit, though they are not explained in great detail. However, the backdrop is a ban on thinking machines and similar advanced technology, which gives Herbert the space to focus on social sciences like psychology, linguistics, and sociology in relation to how the human mind and body might develop in such a world.

The contribution that the social sciences make is crucial to *Dune*'s success as a world-building novel. As Mark J. P. Wolf explains in *Imaginary Worlds: The Theory and History of Subcreation* (2012), constructing an imaginary world requires making changes to the real world, or Primary World, in one or more distinct realms: nominal, cultural, natural, and ontological (pp. 35-36). But most changes appear in the cultural realm, "which consists of all things made by humans (or other creatures), and in which new objects, artifacts, technologies, customs, institutions, ideas, and so forth appear" (Wolf, p. 35). This realm also includes "new countries and cultures, [and] new institutions and orders", and Wolf specifically cites the Jedi and Bene Gesserit as examples of such invented orders (Wolf, p. 35). What is key to making a world interesting and believable, though, is making changes while avoiding implausibilities: "Even though audiences know something is not real, Secondary Belief is easier to generate if the proposed inventions fit in with what the audience knows (or does not know) about the Primary World" (Wolf, pp. 37-38). If an author can make changes that the reader will readily accept based on the reader's current knowledge, the reader is more likely to accept the "world logic" that governs these changes and stay immersed in the imaginary world (Wolf, p. 53). In *Dune*, Herbert makes use of his audience's knowledge by drawing on 20th-century scientific explorations into concepts in both established and emerging social science fields, especially psychology. He also subtly justifies a focus on such sciences by hinting at a past revolt against technological advancement which would lead people to turn toward the development of the human mind and body. In this way, the focus on the human rather than technology is able to contribute to successful world-building by making new orders such as the Spacing Guild, Mentats, and Bene Gesserit and their enhancements seem not only necessary but natural. It facilitates the believability of a science fictional world wherein characters possess extraordinary skills without requiring technological assistance.

The novel sets up the justification for characters having a suspicious attitude toward technology by developing a historical background of a war against thinking machines that resulted in an edict against their creation. Rather than include a lengthy history lesson, though, the novel establishes the historical context through several lines of dialogue between the young protagonist, Paul Atreides, and one of the senior members of the Bene Gesserit, Reverend Mother Mohiam, after he has survived the test to determine whether or not he is human —that is, if he can override his instincts:

> "Why do you test for humans?" he asked.
>
> "To set you free."
>
> "Free?"
>
> "Once men turned their thinking over to machines in the hope that this would set them free. But that only permitted other men with machines to enslave them."
>
> "'Thou shalt not make a machine in the likeness of a man's mind,'" Paul quoted.
>
> "Right out of the Butlerian Jihad and the Orange Catholic Bible," she said. "But what the O. C. Bible should've said is: 'Thou shalt not make a machine to counterfeit a *human* mind.' Have you studied the Mentat in your service?"
>
> "I've studied *with* Thufir Hawat."
>
> "The Great Revolt took away a crutch," she said. "It forced *human* minds to develop. Schools were started to train *human* talents." (*Dune*, pp. 11-12)

Within the space of a mere few lines, the novel sets out several important aspects of the universe: there was some kind of holy war related to a commandment against certain machines, this engendered a focus on developing humans, there exist training schools with this focus, and Mentats represent an example of trained humans. Though terms are left unexplained, the name Great Revolt immediately suggests a reaction against something that was strong enough to cause humans to no longer value machines so highly. By presenting Mohiam's responses as matter-of-fact and logical, the novel prompts the reader to absorb the brief history lesson as an adequate explanation for why a universe would have both space travel and an injunction on advanced machinery. Since there is no reason given to doubt the information, it quickly becomes part of the history of this universe (even though a discerning reader might question the extent to which Mohiam's bias as a member of the Bene Gesserit affects her understanding of the order's origins).

The inclusion of further information about the Butlerian Jihad and the Great Revolt only in the appendices adds to the sense that this historical context is factual data that can sit outside of the main narrative. If the reader wishes to know more about the struggle between humans and machines that Mohiam alludes to, they are required to consult the appendices and use their imagination to expand upon the limited information given there. The placing of this information in the appendices can constitute a technique of effective world-building, since "[s]uch additional information can change the audience's experience, understanding, and immersion in a story, giving a deeper significance to characters, events, and details" (Wolf, p. 2). In "Appendix II: The Religion of Dune", the Butlerian Jihad is described as two generations of chaos and violence during which the "god of machine-logic was overthrown among the masses and a new concept was raised: 'Man may not be replaced'" (*Dune*, p. 502). In Terminology of the Imperium, it is defined as "the crusade against computers, thinking machines, and conscious robots", also known as the Great Revolt, and its chief commandment is the one found in the Orange Catholic Bible: "Thou shalt not make a machine in the likeness of a human mind" (*Dune*, p. 521). Based on these descriptions, the Butlerian Jihad and the Great Revolt appear to be synonymous terms for a campaign of at least several decades against anything that replicated the workings of the human mind. The presentation of the material in a short, encyclopedic-like format gives the illusion of it

consisting of historical facts and prompts the reader to imagine what the crusade involved and how advanced societies had become before destroying their technology. In addition, for the reader familiar with Samuel Butler's *Erewhon* (1872), the name Butlerian Jihad itself hints at an intertextual connection between the destruction of inventions in Butler's satirical novel and similar occurrences in *Dune*. Yet none of this information interrupts the main storyline, as if it consists of facts that only the reader needs to be educated about. There is no need for characters to discuss it, because it is part of the fabric of their lives. In this way, the lack of emphasis on the history plays a role in normalizing historical events and enables the reader to immerse themselves in an alternative universe.

The fictional historical context is critical to setting up one of the foundational themes underlying the novel: that humans should be prioritized over machines and other technologies. Mohiam's explanation clearly connects the aversion to machines with the development of groups that specialize in training humans to gain extraordinary abilities. Her insistence on the importance of the human, emphasized by the continual italicization of the word in this scene, justifies why so many characters are "highly trained", as C. N. Manlove notes (p. 87). It appears that humans would rather rely on their own enhancements than risk going down the path of enslavement, chaos, and death again. Just as when someone loses or damages one of their five senses and the others must adapt and strengthen, the characters in this universe have compensated for the loss of thinking machines by strengthening their own abilities. Mohiam later notes that the training schools that survive are those of the Bene Gesserit and the Spacing Guild, implying that their ranks are composed of humans with extra-developed minds and special talents. This establishes these groups as both long-lived and the ones most concerned with developing human potential. This pro-human, anti-technology theme gives Herbert space to extrapolate from the social sciences in order to develop new orders whose skills are plausible without technological assistance.

The lack of advanced technology makes the Spacing Guild a necessary part of the Imperium as the only means by which travel between planets is possible. Based on Mohiam's limited descriptions of the Guild, the reader knows that it is a "secretive" group that "emphasizes pure mathematics" and maintains a "monopoly on interstellar transport" (*Dune*, pp. 12, 23). It appears to have focused on training humans to pilot ships and enable planetary travel without computational assistance. This is logical and understandable given the historical context provided, for without interstellar travel humans would be cut off from one another. The implication is that the Guild has capitalized on a gap left by the war against machines, which is supported by the appendix's description of it as "the second mental-physical training school […] after the Butlerian Jihad" whose "monopoly on space travel and transport and upon international banking is taken as the beginning point of the Imperial Calendar" (*Dune*, p. 520). Specially trained pilots constitute a necessity in a universe averse to auto-pilot capabilities, and it is likely that they would leverage the demand for their services to extend their control to other areas as well.

Although the enhancements that the Guild cultivates are kept secret from other characters and thus the reader, the text implies that they are gained naturally through tapping into the potential of the human psyche with the aid of the spice known as melange. Melange is an addictive substance "chiefly noted for its geriatric properties" that can also provide

access to new forms of consciousness and "prophetic powers" (*Dune*, p. 523). A conversation between Duke Leto and Paul reveals that a possible reason for the Guild's secrecy is that their navigators are more than ordinary pilots —that "they've mutated and don't look…*human* anymore" (*Dune*, p. 46). As Paul himself begins to change and reach a higher plane of consciousness when exposed to higher concentrations of the spice on Dune, he realizes that his strangeness is like that of the navigators and prescience is indeed possible. Here the connection between piloting and mutations becomes clearer: Guild navigators appear able to guide spaceships due to prescient abilities unlocked by the spice, in essence a powerful drug. The reader is left to fill in the gaps while wondering how humans discovered these abilities and how they were able to become skilled enough to safely pilot entire ships through space.

The indication that a drug is an integral part of the Guildsmen's operations signals that access to expanded consciousness may one day lead the human psyche to new, previously unbelievable achievements. Herbert was writing at the beginning of a period that would become known for a heightened interest and experimentation in drugs. As discussed in Robert C. Cottrell's *Sex, Drugs, and Rock 'n' Roll: The Rise of America's 1960s Counterculture* (2015), college students were leaving school to join LSD cults, Timothy Leary at the Harvard Psychedelic Project was studying whether psilocybin might be used for psychiatric disorder treatment, and the CIA was conducting experiments on hallucinogens in relation to gaining an advantage over foreign adversaries. Herbert himself had a few experiences with hallucinogenic drugs, and though he did not advocate their use, he was comfortable with using them in the novel as a means to heightened awareness and perception (O'Reilly, pp. 82-83). Without having to go into detail, Herbert relied on popular conceptions of drugs being a way to facilitate a person's access to different levels of consciousness in order to develop his world. Thus, he hints at an explanation for how Guild pilots can eschew technology and rely on themselves to guide spaceships through the universe by suggesting that it is part of the mysterious abilities related to the spice. In this way, the characterization of the Guild demonstrates how an aspect relating to psychological study can be utilized and enable an author to bypass the need to include hard scientific explanations.

The ban on thinking machines, computers, and robots makes the order of Mentats another necessary component of the Imperium, one that fulfils the need for the computational processing of data and other feats of logic. As with the Spacing Guild, Mohiam's brief mention of the Mentats serves to both introduce them and prompt the reader to imagine how they might have developed enough skills to fill the gap left in the wake of the Butlerian Jihad. Presumably, without the ability to rely on machines with data processing capabilities, humans had to learn how to memorize and process information in a way that resulted in useful, reliable predictions and calculations. With such skills, the Mentats would then be in a position to assist others with decision-making and other data-driven tasks. Indeed, the reader sees both the Atreides and Harkonnen families employing Mentats who can store seemingly large amounts of data and use it to make projections. Although Baron Harkonnen describes his Mentat, Piter de Vries, to his nephew in an almost dehumanizing way —"This is a Mentat, Feyd. It has been trained and conditioned to perform certain duties"— he still clearly values de Vries's skills (*Dune*, p. 18). After the Baron commands him to "[f]unction as a Mentat", de Vries outlines possible scenarios and probabilities relating to enemy movements

and provides an analysis of the plan to displace the Atreides family (*Dune*, p. 18). Duke Leto is also shown consulting with his Mentat, Thufir Hawat, as they strategize about how to manage finances, outmaneuver their enemies, and consolidate their power. As David Miller writes, "All the major power brokers need a Mentat to guide their machinations" (p. 19). There is every indication that these leaders rely on this assistance and that it is normal that humans are performing the work of computers. Although little information is given about Mentat training or motivations, such detail is unnecessary because the reason why humans would need to adapt themselves to fulfil the role of a computer has already been established.

Viewed within the context of the so-called cognitive revolution begun in the 1950s, Mentats' abilities reflect an extrapolation of then-contemporary psychological research into the capabilities of the human brain. The 1950s saw an increasing interest in theories of the mind, with topics such as artificial intelligence, perception, and information theory being discussed by experimental psychologists who were dissatisfied with the limitations of behaviorism (G. Miller, p. 142). Earlier work was revived, such as the theories of perception developed by Gestalt psychologists, who had theorized that "the way the parts are seen is determined by the configuration of the whole, rather than vice versa" (Gardner, p. 112). In their view, people who could look at the whole picture and have the "capacity to grasp the basic fundamental relations" were partaking in more intelligent processes than those making piecemeal associations (Gardner, p. 113). The cognitive revolution led to cognitive scientists theorizing about the mind and how memory works. In part, this was spurred by advancements in computing. As Howard Gardner explains in *The Mind's New Science: A History of the Cognitive Revolution* (1985), "There is little doubt that the invention of computers in the 1930s and 1940s, and demonstrations of 'thinking' in the computer in the 1950s, were powerfully liberating to scholars concerned with explaining the human mind" (Gardner, p. 40). The significance to psychology was that psychologists became more willing to consider how the mind processed and represented information, since the brain could be considered a powerful computer based on its operating via the principles of logic (Gardner, p. 19). This involved a recognition of the human mind as being more complex with more capabilities than had previously been thought. Such recognition, as it permeated into society's understanding of human potential, would serve to make the abilities of the Mentats seem potentially realizable.

Thus, rather than depict the outsourcing of logical functions, *Dune* keeps dominion over computational thinking in the minds of humans in a plausible way. Herbert's grandmother, Mary Herbert, apparently provided the inspiration for this type of human whiz with computation, being an uneducated woman who nevertheless had an aptitude for figures and a remarkable memory (O'Reilly, p. 12; B. Herbert, p. 34). Indeed, the original computers were people, with the term referring to a human who solved equations; it was only after 1945 that it began to refer to machines that could solve complex mathematical problems (Ceruzzi, p. 1). It should also be noted that not only were computers still in the early stages of development at the time Herbert was researching for and writing *Dune*, but there was an increasing level of exasperation in the U.S. regarding automation and the related alienation of workers consigned to attending machines (Lepore, pp. 558-559). It is significant, then, that the Mentats' skills highlight the strength of the mind and show that society can function

without relying on external computers. Their characterization as being capable of great feats of logic flows on from the emphasis in the novel on human over technological development. They appear to have abilities that a human could develop in the future, allowing them to contribute to the reader's understanding of a world where cognitive development has improved to the point where humans are relied upon to act as computers.

However, in an environment full of skepticism about anything reminiscent of thinking machines, the Mentats are at times critiqued and even dehumanized for their logical thinking patterns. Both the Bene Gesserit and Baron Harkonnen harbor an attitude of caution toward Mentats, indicated by the language they use in dialogue with and about Mentats. As shown in the passage above, Mohiam suggests to Paul that the Atreides' Mentat is an object worth studying —a human who fills some of the gap left by the destruction of computers. Another Bene Gesserit woman, Jessica, who is Paul's mother, tells Hawat directly that his "projections of logic onto all affairs is unnatural, but suffered to continue for its usefulness" (*Dune*, p. 153). Although she seems to question his very humanity with this choice of the words "suffered" and "unnatural", she clearly does see value in Mentat training because she has permitted Paul to undergo the training in the hope that he might gain an additional skill. The notion that Mentats are constrained by their adherence to logic also appears in the descriptions of the Baron's Mentat performing his duties. While functioning as a Mentat, de Vries proceeds to straighten his body and "assum[es] an odd attitude of dignity—as though it were another mask, but this time clothing his entire body" (*Dune*, p. 18). His posture and demonstration of detailed analysis signal that he is a special type of human —one trained to be more than a mere calculator. Yet he is shown disconnected from his body while in the Mentat trance, indicating that the Mentats embrace a mind-body split to the point that they lose some of their humanity. The clearest indication that a critical attitude toward Mentats is justifiable comes through the dramatic irony that Hawat is completely wrong about the identity of the traitor to the Atreides family, yet smugly believes until the very end of the novel that he knows best: "'I've always prided myself on seeing things the way they truly are,' Thufir Hawat said. 'That's the curse of being a Mentat. You can't stop analyzing your data.'" (*Dune*, p. 207). More so than other enhanced groups, Mentats reflect the problems with technology insofar as they are similar to computers in their reliance on data and quantifiable measurements. The presence of this group both reinforces the fictional historical context and enables an examination of potential consequences of humans becoming more like machines.

The emphasis on the development of the human is also noticeably illustrated in the all-female order of the Bene Gesserit, whose members showcase an impressive array of abilities that seem to fill a natural void left in the absence of advanced technology. The Bene Gesserit are considerably better developed characters than those in the other enhanced groups, largely because Jessica is such a prominent figure with a wide skillset displayed throughout the novel. However, there is little elaboration on their training, prompting the reader to imagine the kind of intense education likely required for women to gain their abilities. Like the Mentats, the Bene Gesserit act as close advisors, but they also possess a special ability to truthsay, or detect whether or not people are lying based on their speech. Especially in a world without lie-detector technology, such truthsaying is a valuable skill,

particularly in the realm of politics. Its effectiveness is shown through several examples of the Baron Harkonnen and others ensuring they do not take any action that would entail them being revealed as liars by a Truthsayer. Another role the Bene Gesserit hold is that of administrators of the test for humanness, which appears necessary to ensure that people can rise above their animal instincts as thinking creatures and never again be enslaved by machines. One of the most mysterious items in the novel is the black box that Mohiam uses for Paul's test: a box which stimulates nerves to feel pain but does no physical damage to the body. What might seem like an extreme measure —her holding a poisoned needle known as a gom jabbar at his neck and forcing him to endure the nerve pain or else die— fits within the reader's emerging understanding of the precautions humans must take against falling back into letting their instincts or machines override their own reasoning. Yet the Bene Gesserit themselves have exploited the existence of human weakness by mastering the ability to control others via two main mechanisms: the religious propaganda of the Missionaria Protectiva and the controlling intonations of the Voice, which adds additional complexity to their characterization. The Bene Gesserit also have developed precise control over their bodily functions, to the point that they can manipulate reproduction, tap into the memories of their female ancestors, and engage in hand-to-hand combat on a level unparalleled in the Imperium. In an environment without artificial reproduction, computer memory, or advanced weaponry, women have taken it upon themselves to expand their abilities to excel at virtually everything they do.

The above examples demonstrate that the Bene Gesserit are primarily concerned with control: control of their own minds and bodies as well as those of others around them. What makes them function well as characters in the world of *Dune* is that this control seems achievable based on an extrapolation from contemporary explorations into the social sciences of psychology, linguistics, and sociology.

Dune is permeated by ideas and concepts from psychology, and the incorporation of elements from this field in the characterization of the Bene Gesserit facilitates the reader's belief in these women being able to perceive and respond to their environment in extraordinary ways. Psychology was a burgeoning field in the 20th century, containing a variety of theories about how the mind and body function and how much control a person can exercise over their thoughts and behaviors. In fact, Herbert took a keen interest in psychology and was influenced by his friendship with two psychologists, Ralph and Irene Slattery, "who gave a crucial boost to his thinking" regarding Freudian and Jungian psychoanalysis (O'Reilly, p. 18). Although psychology is considered a social science, more than other disciplines it "self-consciously modelled itself upon successful sciences such as physics, chemistry, and biology" (Greenwood, p. 6). In this way, psychologists attempted to gain legitimacy for their investigations into the often-subjective realm of human cognition, emotion, and behavior, including the study of "sensation, perception, emotion, memory, dreaming, learning, language, and thought" (Greenwood, p. 16). Looking at the Bene Gesserit, the reader sees a group that has created a whole training system to bring order to these seemingly instinctive and uncontrollable aspects.

The Bene Gesserit's training system and approach to life, known as the Bene Gesserit Way, is an amalgamation of elements from psychology and Eastern traditions as well as the

Jesuit religious order, which their name signals (Kennedy, p. 101). The term 'Way' signals a link with the Way in Taoism and a striving for balance in life. Following the Way involves the Bene Gesserit gaining skills in Gestalt psychology and the "minutiae of observation", to the point of being able to perceive the slightest details and analyze their significance as a whole (*Dune*, p. 5). Like the Mentats, the Bene Gesserit appear to be able to take a big-picture view based on their gathering of small bits of data. But they also learn to gain control of every muscle and nerve in the body through training in prana-bindu, prana standing for "prana-musculature" and bindu for "bindu-nervature" (*Dune*, pp. 526, 514). It is implied that this training is what enables Jessica to best the armed Fremen leader Stilgar in hand-to-hand combat, which makes her superior fighting abilities believable not only for herself as an individual, but also for the Bene Gesserit as the group who trained her. Use of the Sanskrit words *prana* and *bindu* reinforces the link with Eastern philosophic traditions and suggests the possibility that some of these abilities may already have been achieved in a land unfamiliar to the reader. There is also a link with Eastern traditions in the appearance of biofeedback, the technique whereby a person can self-regulate or control functions normally regulated by the body's autonomic nervous system at an unconscious level ("Biofeedback"). Although biofeedback was named and recognized in the U.S. in the 20th century, there are thousands of years of yogic practice that demonstrate a similar autonomic control (Peper and Shaffer, pp. 142-143). Biofeedback appears to be an important aspect of the Bene Gesserit's prana-bindu skillset, as demonstrated by Jessica when she is shown "*compos*[*ing*] *herself in bindu suspension to reduce her oxygen needs*" after being covered in a sandslide (*Dune*, p. 249). This establishes that a woman's control of her nerves and muscles extends to their unconscious movements as well and becomes significant to explaining how a woman is able to manipulate fertilization and choose whether to become pregnant and what the sex of her fetus will be. Thus, rather than the reader dismissing the Bene Gesserit's reproductive control (and breeding program) as fantastical, they are more likely to instead speculate about the details and make connections to advancements in reproductive control and technology in the real world.

A more obvious element from psychology in the characterization of the Bene Gesserit is that of the collective unconscious, a concept from Jungian psychology that provides at least a layer of plausibility to the presence of Other Memory. In a world without computer memory, it follows that humans must rely on themselves to remember their histories and pass on stories and ideas to their community, whether through oral or written means. But the Bene Gesserit have gone one step further and discovered a way to make a psychic connection with their ancestors and thus gain access to their own bank of ancestral memory. In *Dune*, this concept is described through Jessica's point of view when she ingests the Fremen's poisonous Water of Life as part of the ceremony to become a Reverend Mother. Somehow going inside her own psyche, she encounters the psyche of the dying Reverend Mother Ramallo, whom she is physically touching, and Ramallo transfers her memories and those of her Fremen ancestors into Jessica's mind: "The experiences poured in on Jessica —birth, life, death— important matters and unimportant, an outpouring of single-view time"; "And the memory-mind encapsulated within her opened itself to Jessica, permitting a view down a wide corridor to other Reverend Mothers until there seemed no end to them" (*Dune*, pp. 357-

358). Both individually and as a group, the Bene Gesserit benefit from the guidance of Reverend Mothers "who have, through poison, joined the collective memory of all their female ancestors" (D. Miller, p. 20). Although Herbert keeps the descriptions surrounding Other Memory opaque and at times inconsistent, there remains a clear parallel with the collective unconscious and the relevancy of genetics. In Jung's view, the collective unconscious is a part of the unconscious that contains memories, instincts, and experiences that are shared among humans (Colman). Such racial memory is distinct from the personal unconscious and presumably inherited through genetics (Kellerman, p. 9). By drawing on Jungian concepts in his characterization of Other Memory, Herbert places it on a psychoanalytical foundation such that even if readers disagree with the tenets, they are likely to be familiar with it as a potentially believable idea with some adherents.

The exercising of control over the unconscious is also a critical factor in the Bene Gesserit's roles as Truthsayers and users of the Voice, whose techniques combine ideas from psychology and linguistics into a conceivable way of influencing others. In an interview, Herbert once explained that a low level of vocal control was already possible by knowing a few details about someone and altering one's language and tone, so it was not too far of an extrapolation for him to show that greater vocal control might be achievable in the future (O'Reilly, p. 61). One of the key influences on Herbert was the pseudo-scientific field of general semantics, what O'Reilly describes as "a philosophy and training method developed in the 1930s by Alfred Korzybski" that revolves around problems with people's use of language and the unconscious assumptions built into it (O'Reilly, p. 59). By incorporating it into *Dune* through the Bene Gesserit's "technology of consciousness", Herbert speculates that people can train themselves into new linguistic habits and even use their new perception of verbal and nonverbal cues to influence others (O'Reilly, p. 62). The Bene Gesserit's Truthsaying ability relies on their skill at perceiving a variety of small vocal cues in others' speech to determine whether others believe what they are saying. Any reader familiar with someone who is highly perceptive and hard to deceive can see this ability as realistic for a group with an advanced understanding of the psyche and its connections with language. The Bene Gesserit's ability to use the Voice is more complex, demanding that they first register others' speech patterns and then speak back to them in a customized tone that commands them to obey. The Voice appears to work on an unconscious level since most subjects are unaware when it is used on them and obey instinctively. Like Other Memory, the Voice is never fully explained, but there is enough detail to enable the reader to see that it is a kind of psychological trick that plays on the unconscious and would require a sophisticated level of linguistic skill. This leads to a measure of irony wherein the Bene Gesserit are administrators of the test for humanness, which rewards humans for rising above their instincts, yet also users of the Voice, which manipulates humans at a level below their conscious control.

The test for humanness illustrates an aspect of Herbert's concern with sociology, the study of societies and how they develop and function. This test appears to be a critical component of the world of the novel because it acts as a gatekeeper for people who are unable to control their bodily urges and instincts. Paul must endure intense pain in order to prove he is human: "It mounted slowly: heat upon heat upon heat…upon heat. […] His world emptied of everything except that hand immersed in agony […]. He thought he could feel

skin curling black on that agonized hand, the flesh crisping and dropping away until only charred bones remained" (*Dune*, p. 9). Yet although the first key conflict in the novel revolves around this test, there is very little information given about how it functions in the society at large. Through Jessica's mentioning of it to Stilgar, the reader knows it is a part of the Fremen's society as well, but they are left to speculate beyond this about whether it is mandatory for everyone in the Imperium, how many people fail, and when the Bene Gesserit developed the nerve induction box. What is clear is that the Bene Gesserit use the test as part of their shaping of society. Both Jessica and Paul are shown as never forgetting their memories of that test, reminding the reader in turn why society has had to develop in such a way as to have a test for humanness, namely because of the Butlerian Jihad. Presumably, people who fail the test are more susceptible to letting themselves be enslaved by machines and therefore must be removed from society at an early age. Without this historical context present, the test might seem nonsensical or depraved; instead, it follows on from the reader's understanding of this world and appears to be a way of determining a person's likelihood of resisting their baser instincts should the need arise. The careful attention to crafting a society which could reasonably be expected to have accepted such a test as a necessary precaution enhances the world-building of *Dune* and demonstrates the usefulness of drawing on sociological understandings in such an endeavor.

Overall, the lack of emphasis on aspects from traditionally "hard" scientific fields such as physics and mathematics makes it believable that an all-female group that largely eschews technology could maintain such a powerful hold over society. As can be seen, the Bene Gesserit's control often is exerted behind the scenes. However, the portrayal of their wide-ranging influence and authority demonstrates that they possess a great deal of "soft" power, having responded to, and taken advantage of, the suspicion around technology to develop themselves into extraordinary humans. In part through their mastery of psychology and linguistics, they are shown having found a niche in manipulating politics, running a secret breeding program, acting as lie detectors and banks of ancestral memory, and engaging in hand-to-hand combat, without these abilities seeming fantastical or illogical in their world.

Complementary to the historical context of the Butlerian Jihad is the medieval, feudal-like setting, which reinforces that this world is one lacking in advanced technology. From the first few pages the reader becomes aware of the existence of the Padishah Emperor, Castle Caladan, Jessica as a Bene Gesserit Lady, and Duke Leto as the leader of one of the Great Houses of the Landsraad. These proper nouns provide a strong signal that the characters live under some kind of feudal regime with a hierarchy of rulers, titles for nobility, fiefs, and medieval castles as residences. Castle Caladan is described as an "ancient pile of stones" that has been in the Atreides family for twenty-six generations, evoking an image of a European fortress built on a hill whose ownership is safeguarded through long dynastic lineages (*Dune*, p. 3). When the term "faufreluches class system" appears, it also indicates that there is an old but familiar political system in play, rather than a heretofore unknown new one. Even without checking the appendices for the definition —"the rigid rule of class distinction enforced by the Imperium. 'A place for every man and every man in his place'"— the reader can imagine people being part of an imperial system where their role in the order is largely pre-determined (*Dune*, p. 518). Although such a system would not necessarily need to

be lacking in technology, it makes for a more comfortable fit to have societies eschewing technology set in an environment reminiscent of a medieval period during which feudalism was prominent. The setting invokes a feeling of technological simplicity and court intrigue, as well as allowing all of the stereotypes about this historical period to surface. The Middle Ages are still popularly considered to be a period of "ignorance, superstition" and stifled development, despite challenges to this narrative by more recent historians (Power, p. 16). Therefore, the evocation of this period is important to the relatively quick establishment of a world in which it is believable that technological advancement has been halted and humans have had to develop themselves to have a functional society.

By placing all of these new orders —Spacing Guild, Mentats, Bene Gesserit— in this setting, Herbert successfully maintains a link with real-world institutions and enables the reader's expectations to adjust to a framework different from the futuristic, "hard", high-tech one available in other science fiction narratives. Skills valuable in popular conceptions of the period of feudalism are valuable in this world as well. The reader sees Paul being trained in swordfighting and both Paul and Jessica defeating enemies in hand-to-hand combat with abilities gained through their prana-bindu training. Although body shield technology does exist, because of the potential for shields to attract sandworms or explode if they are hit by a lasgun, they are less useful on Dune and so those who can attack or defend themselves competently without them have a distinct advantage. At one point, Paul must defeat an assassination weapon, a hunter-seeker, by relying on his wits and honed reflexes when his shield is out of reach (*Dune*, pp. 67-68). Atomic weapons also exist and the major houses have their own personal stores, but there is an injunction against their use: as Paul states, "The language of the Great Convention is clear enough: 'Use of atomics against humans shall be cause for planetary obliteration'" (*Dune*, p. 450). When Paul decides to use them against a planetary feature instead, the explosion is given little narrative description, which serves to deemphasize the technology. Indeed, after the explosion, the focus turns to the Fremen riding the sandworms, reminiscent of knights charging into battle: "Out of the sand haze came an orderly mass of flashing shapes—great rising curves with crystal spokes that resolved into the gaping mouths of sandworms, a massed wall of them, each with troops of Fremen riding to the attack. They came in a hissing wedge, robes whipping in the wind as they cut through the melee on the plain" (*Dune*, p. 464). The reader continually sees that it is the development and strengthening of humans' own abilities that are beneficial in this world, more so than even powerful technological instruments. The choice of this historic setting, then, as opposed to something based on more modern conceptions of federations of states or democratic structures, makes it more likely that readers will accept the novel's focus on the human.

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