Linguistics of the Post-Apocalypse

Atomic Semiotics and its Application in Fallout 3, New Vegas, 4 and 76

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In 1981, a group of linguists, anthropologists, nuclear physicists, science fiction authors and behavioural scientists called the Human Interference Tast Force (HITF) met in the USA to take precautions in the event that the Cold War escalated under the lead of semiotician Thomas Sebeok. The brief: to work out a way to forever prevent people from entering nuclear-contaminated sites, even if these future generations don't understand any current language.

The ideas included images that drew on human biology – such as screaming or melting faces – or the transformation of entire landscapes above repositories into pseudo-religious places of worship that must not be desecrated, concrete-laden bulwarks, 'atomic priesthoods' and many more ideas from the architectural world, sociology, bioengineering and more.

None of the various proposals were ever put into actual practice. What is fascinating, however, is that a considerable amount of the ideas from this discipline can be found in the games of the *Fallout* series, whether in direct form or satirised.

The paper shows the influence of the discipline on the setting design and the character factions of the *Fallout* series under development by Bethesda. It starts with a cultural history of atomic semiotics, followed by affiliating concrete examples from the *Fallout* games with the HITF's ideas found in the task force's declassified military report from 1984: from the atomic priesthood design in the *Brotherhood of Steel*, *Vault-Tec*, the *Enclave* and the *Children of the Atom* to the clever usage of the HITF's findings in game design to turn deterrence into interest through monumental bulwarks in quest locations of *Fallout 3, 4, New Vegas* and *76*.

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Introduction

> "The game's unique conception of history is embedded in, and mediated by, its retrofuturistic aesthetics, which convey a sense of nostalgia, masked by an ironic distance."

In his thesis Atom Bombs, Synths, and the Red Scare: American Ideologies in *Fallout 4*, Pluschkovits[1] could hardly have summarised the narrative aspirations of the series more aptly. The world of the Fallout video game series makes no secret of its satirical aspirations. The game world, which is aesthetically based on a futuristic version of a never-ending mid-twentieth century, largely parodies three major technological and ideological achievements of the time: the civilian use of nuclear power, the rocket-powered departure into space and communism in all its forms as the absolute enemy of a supposedly 'free' world in the Cold War[2]. The latter primarily informs the setup of the game story (through the mutual nuclear

[1] Pluschkovits, Markus, Atom Bombs, Synths, and the Red Scare: American Ideologies in Fallout 4, 2020, p. 49.
[2] Pluschkovits, Atom Bombs, p. 51.

annihilation of the USA and China before the playable actions of all parts) and various narrative strands of the different titles - for example in the form of the anti-communist giant mech Liberty Prime in Fallout 3[3] or the Chinese propaganda bots dropped over the Appalachians in Fallout 76[4]. In addition to the narrative influences, the rocketry and nuclear power also made a big impression on the visual design of the games. The world of the Fallout games is full of rocket-shaped cars, nuclear cooling towers and defensive structures, as well as nuclear-branded and rocket-shaped products such as *Nuka Cola* and *Red Rocket Truck Stop*.

The 'dirty downside' of these innovations also finds a place in the games: barrels of leaked nuclear waste are a common threat in the wastelands of *Fallout 3* (Bethesda, 2008), *Fallout New Vegas* (Obsidian, 2010), *Fallout 4* (Bethesda, 2015) and *Fallout 76* (Bethesda, 2018). Military bases, often full of dangerous radioactivity for unprepared players, killer robots or mutated monsters, dot the various game landscapes of the titles; in *Fallout 76*, firing a nuclear missile and temporarily contaminating a region is even an integral mechanic of multiplayer interactions. It's no wonder then that the series is also concerned with what should have happened to the waste from the nuclear boom in the game universe before the organised civilisation of the USA perished in the nuclear war, and what consequences the nuclear waste lying around everywhere means for the social groups that sparsely reunite after the apocalypse.

This paper links specific architectural forms (chapter Monuments, Writings and Signs), social forms (chapter Atomic Priesthoods) and biologies (chapter Biological Codes and Radiating Cats) in the analysed *Fallout* games with a discipline of the sciences that looked into the possibly post-apocalyptic future of a nuclear catastrophe and which will be presented in the following chapter: atomic semiotics.

A Short History of Atomic Semiotics and the HITF

In 1981, at the behest of the U.S. Department of Energy and the engineering company Bechtel, which had built the world's first breeder reactor and the first privately owned nuclear reactor in the United States, a group of 13 linguists, anthropologists, nuclear physicists, engineers and behavioural scientists[5] came together to solve a pressing problem. The Human Interference Task Force (HITF) was tasked with creating measures to prevent future generations from opening nuclear storage sites, i.e. to prevent human interference, in the face of the possible nuclear escalation of the Cold War at any time. The specific subject of the work was the planned Yucca Mountain nuclear waste repository under the mountain of the same name in Nevada, the completion and utilisation of which was supposedly imminent at the time, but which remains in a planning status to this day. The task force set itself a target time frame of 10,000 years: the idea[6] was that during this time, the spoken languages of mankind would have developed so extensively that signs installed today, no matter how durable, would probably no longer be understood.

According to semiotician Thomas Sebeok, who served as secretary of the HITF, it is also uncertain whether archaeological research can still translate today's languages or whether there is still research depending on the degree of destruction of civilisation. Furthermore, it cannot even be ruled out that due to radioactive radiation, environmental adaptations and other

[3] Fallout Wiki, Take it Back!.
[4] Fallout Wiki, Liberator.
[5] UDoE, Reducing the Likelihood of Future Human Activities That Could Affect Geologic High-level Waste Repositories, 1984, p. 121-122.
[6] Sebeok, Thomas, Communication Measures to Bridge Ten Millennia, 1984, p. 1.

mutations, humanity has taken on a physiologically different form, with sensory organs that function differently, so that writing and language are not permanently reliable mechanisms.[7]

Sebeok's Technical Report, written in 1981 and declassified in 1984[8], describes the basics of what is now called atomic semiotics. Sebeok describes that only the widest possible redundancy, i.e. repetition of the message in as many ways as possible, can have a realistic chance of transmitting the warning into the distant future. This includes:

a.) verbal and averbal messages (the core fields of linguistics and semiotics)[9] and in particular combinations of iconic, indexical and symbolic signs, i.e. writings and images in different reference relationships, e.g. warning in different languages combined with symbols invoking danger such as skull depictions,

b.) cultural and religious markers such as ritualisation, myth-making and superstition[10] that prohibit or make it unattractive to enter an area,

c.) classist hierarchies such as a dynasty of initiates with access to knowledge of the deposits, who, as leaders or advisors to leaders, make entering the territories a punishable offence[11]; Sebeok calls this group the 'atomic priesthood',

d.) a relay system in which the warning is updated at small intervals instead of being static. The system could either be in the hands of the 'atomic priesthood' (internally in the dynasty or externally, by means of disseminated written material), be carried out scientifically by means of orders and requests to groups a few centuries in the future by means of signs or similar, or be processed in the rituals described in b)[12].

Although the problems addressed by the HITF can still be considered unsolved today, the solutions it proposed were never applied. This certainly has to do with the end of the Cold War, which took place relatively shortly after the evaluation of the results in 1984, as well as the endless limbo of the Yucca Mountain repository, which was still considered 'in planning' until 2021 under the U.S. administration of Joseph Biden[13]. However, the task force triggered a research movement that was particularly popular in German-speaking European regions due to its proximity to the Cold War front and still exists today. The central thinker of the movement was Roland Posner, editor of the Zeitschrift für Semiotik from Tübingen, who dealt with the topic in the aforementioned journal[14] from 1982 and whose anthology Warnungen an die Ferne Zukunft from 1990 can be considered a fundamental work on atomic semiotics that spans East and West. In it, former members of the HITF, including Sebeok[15] himself, put forward their

[7] UDoE, Reducing the Likelihood, 8-12; Sebeok, Communication Measures, p. 1.
[8] Sebeok, Communication Measures.
[9] Sebeok, Communication Measures, p. 1.
[10] Sebeok, Communication Measures, p. 21.
[11] Sebeok, Die Büchse der Pandora und ihre Sicherung. Ein Relaissystem in der Obhut einer Atompriesterschaft, 1990, p. 165-166.
[12] Sebeok, Büchse, p. 164-166.
[13] Rubin, Gabriel T., Escape From Yucca Mountain: Biden Administration Promises Progress on Nuclear Waste, 2021.
[14] See Fabbri, Paolo, Human Interference Task Force, 2015.
[15] See Sebeok, Büchse.

own proposals. Eastern European thinkers and experts such as the Polish science fiction author Stanislaw Lem[16] also contributed.

Three Methods of Atomic Semiotics and Their Realisation in Fallout

The common thread between atomic semiotics and the *Fallout* game series is already apparent on the surface: *Fallout* deals with the social constructs that emerge and struggle with each other after the nuclear catastrophe (see chapter Atomic Priesthoods), and with the effects of radioactive radiation on the environment and living beings (see chapter Biological Codes and Radiating Cats). And a look into the real past, into the HITF's work assignment and the emergence of atomic semiotics, also reveals characteristics clearly applicable to *Fallout*: the creative, imaginative conception of a post-catastrophic, nuclear-influenced world, by people of different specialisms, ranging from nuclear physics to fiction. If video games had been as firmly anchored in social cultural memory at the time of the task force as they are today, the panel might have included video game authors or critics.

No explicit mention in the *Fallout* game series suggests that the creators of Fallout at Bethesda Game Studios or Obsidian Entertainment specifically incorporated atomic semiotics into their games. However, several things point to this: Nuclear anxiety, the fear of nuclear annihilation and the question of what might come after, which made the state-ordered gathering of the Human Interference Task Force possible in the first place and nuclear semiotics as a science conceivable, were an integral part of the cultural sensibility during the Cold War in the NATO states (and presumably also at least of the informed decision-makers in the Warsaw Pact territories). This anxiety was impressively visualised by the media-effective Doomsday Clock of the The Bulletin of the Amotic Scientists, standing at six minutes to midnight in 1988[17], immortalised in Stephen King novels as well as The Who and The Clash songs[18]. Atomic semiotics itself has been part of the Cold War's perception of the past as a curiosity since the de-classification of Sebeok's conference report in 1984[19], but at the latest since the extensive public work on the subject by universities in the late 1980s and early 1990s[20].

Journalistic and popular science analyses of the topic reached a high point in the 2010s with features in The Atlantic[21] and Vice[22]. In the German-speaking world[23], the aforementioned mass media discussion of the topic can be found much earlier, starting in 2012 with articles in Spektrum der Wissenschaft and reprints in Die Zeit through to youth-focused reporting, for example in Fluter from the Federal Agency for Civic Education (bpb)[24].

In fact, there is at least one allusion in *Fallout: New Vegas* to the genesis of the nuclear semiotics, the planned securing of the Yucca Mountain repository in Nevada in 1981. While this remains in a planning status in reality to this day[25], Yucca Mountain has actually become a repository in the alternative history of Fallout. In the quest 'Come Fly With Me' in *Fallout: New Vegas*, the player avatar must find a radioactive isotope in order to launch a rocket. This is found on the corpse of Mr RADical, an adrenaline junkie who, according to the in-game

[16] See Lem, Stanislaw, Mathematische Kodierung auf lebendem Trägermaterial, 1990.
[17] Smith, A Report: Nuclear Anxiety, 1988, p. 557.
[18] See Elder, Robert & Gabel, J.C., The Doomsday Clock at 75, 2022.
[19] See Sebeok, Communication Measures.
[20] See for example Posner, Roland, Atommüll als Kommunikationsproblem, 1990
[21] Beauchamp, Scott, How to Send a Message 1,000 Years to the Future, 2015.
[22] Oberhaus, Daniel, Radioactive Cats and Nuclear Priests: How to Warn the Future About Toxic Waste, 2017.
[23] Which can be assumed relevant for influences on the series due to the English-German bilingual Josh Sawyer, lead director of the cancelled Fallout 3 prototype with the code name Van Buren and of Fallout: New Vegas.
[24] Förster, Andreas, Achtung, da strahlt was, 2016.
[25] United States Environmental Protection Agency (EPA), What is the Yucca Mountain repository?, 2023.

narrative, travelled from radiation source to radiation source in a radiation suit to test its effectiveness. According to the audio diary, Mr RADical found the radiation suit, whose leaks were to be his undoing, in the actively used Yucca Mountain Repository Site[26].

Monuments, Writings and Signs

Nuclear waste alone is not the only problem that could be protected from misuse by future generations by means of nuclear semiotics. Posner[27] already saw rocket propulsion and the long-range weapons invented with it as similarly dangerous - especially in combination with the destructive possibilities of nuclear warheads. He therefore also proposes a joint thinking of nuclear power and rocket propulsion within nuclear semiotics, as had already taken hold of the media landscape and civil society in the USA in the 1950s. Historian and physician Ronald D. Gerste writes about the space boom of the 1950s: "Suddenly, 'Starlight Cafes' and 'Space Motels' emerged, and aerofoil-like or rocket-like forms found their way into architecture"[28]. The design and architectural influences did not even stop at obvious safety risks: "During this period, cars were given powerful chrome fins and other ornaments reminiscent of rockets. Sometimes this cosmic exuberance of the designers was potentially fatal: the 1954 Cadillac Eldorado had a conical and completely superfluous decorative element on the steering wheel, which was aimed at the driver like a missile and had such an effect in one famous case: the entertainer Sammy Davis Jr. was hit in the face in an accident, losing an eye."[29]

A look at the *Fallout* series reveals that this design philosophy has taken root in the art design of the games. Cars, which usually appear as destructible, exploding objects in the game worlds, follow Gerste's description of a Cadillac almost exactly. The petrol station brand Red Rocket, which was introduced to the series with *Fallout 4*, features wing-shaped canopies and presents a red, launching rocket above each branch as its logo[30]. With good reason, then, the design decisions of nuclear buildings such as power plants and repositories and missile silos are brought together in this chapter.

The most obvious way to mark a militarily or radioactively dangerous area that should not be entered or otherwise disturbed is to build physical defences and signage. Accordingly, nuclear semioticians devoted much of their time to possible architectural and written monuments. However, the disadvantage of all solutions involving construction was already obvious to the HITF: their decay. No building or shield would realistically survive the full 10,000 years envisaged undamaged, as regular maintenance could not be expected in the case of a civilisation destroyed by nuclear weapons. Language and writing would also change so much over time that contemporary languages and scripts might be unrecognisable to later generations, especially if there was no longer any archaeology and the records of historical linguistics had possibly been destroyed. The HITF and its successors made use of this knowledge of the effect of ruins: walls and teeth would crumble, but sufficiently large, stable buildings with a deterrent effect on the outside would still have a repulsive effect to some extent even in a decayed state, especially if they were defined as taboo sites by deliberately placed myths and ritualisations (more on this in chapter Biological Codes and Radiating Cats).

At the same time, the task force was also aware of the allure of forbidden and mysterious places for adventurers: 'ruin porn', or less provocatively, 'the irresistibleness of such a decay'[31]

[26] Fallout Wiki, Yucca Mountain; Fallout Wiki, Mr RADical.
[27] Posner, Atommüll als Kommunikationsproblem, p. 7.
[28] Gerste, Ronald D., Ein großer Schritt für die Menschheit, 2019, p. 12; Translated by me.
[29] Gerste, Ronald D., Ein großer Schritt für die Menschheit, 2019, p. 12; Translated by me.
[30] Fallout Wiki, Red Rocket.
[31] Pluschkovits, Atom Bombs, p. 57.

describes the attraction of ruined places, whose scientific description Pluschkovits traces back to Walter Benjamin's observations in the 1920s[32]. “Others might see the ‘dangerous’ or - even worse - the ‘forbidden’ places as personal challenges to their courage, just as certain ‘sacred’ places have attracted unwanted intruders,” Bastide and Fabbri[33] caution, who tend to oppose the labelling of warning sites as monumental places.

The basic principle for the possible safeguarding of a repository or nuclear silo must therefore always be redundancy: Conveying the warning message via as many complementary and simultaneously similar channels as possible. In addition to threatening architecture and ritualised tabooing, signs made of corrosion-resistant materials should therefore also be used according to the HITF, for the nature of which reference was made to NASA's research on the engraved gold plates in space probes[34].

Particular attention was paid to form in the architectural and landscape architectural considerations. Voigt[35], for example, suggested placing warning signs in concentric circles or spiral patterns starting from the camp site - with updated language and lettering every few centuries. The form of the sign arrangement, which concentrates on the location in the centre and produces older, more decayed signs as an adventurer approaches, is intended to create a warning effect in terms of landscape architecture alone, because it emphasises the importance of the centre. The written warnings create a sense of threat. Furthermore, the warning written in different ancient, divergent languages can function as a kind of rosetta stone for future civilisations to decipher more technically complex warnings in forgotten languages within a repository complex. Iconic and symbolic markings on the signs should also contribute to the redundancy of the message: although cultural markers such as the atomic symbol are worthless without the basic social knowledge of its meaning, the fact that the warning meaning of the sign has been retained, for example through legends and myths, can at least be taken into account as a possibility. Biologically derived signs, i.e. those that point iconically to events, such as skulls or stylised depictions of dead plants or physical injuries, can also possibly be understood without prior cultural knowledge[36]. Voigt's idea cannot be separated from the fact that informed individuals continue to follow the plan at regular century intervals and erect new signs with updated lettering further away. It therefore goes hand in hand with Sebeok's proposal of an atomic priesthood (see chapter Biological Codes and Radiating Cats).

The idea of architectural monumental buildings was more closely linked to the mythical attraction of a ruin than Voigt's idea of a ‘protective circle’ that was steadily decaying inwards. Shapes that were biologically predetermined as threatening (through their association with hunting animals or poisonous prey), such as gigantic concrete and steel spikes, installations in the form of glowing eyes or bright warning colours, were to be used to create deterrent bunker entrances or bases. This effect could only be intensified by decay as long as the actual sealing function of the structures was not impaired. Posner[37] also brings redundancy into play here: additional monuments with a similar deterrent effect, but without a protective function, could unsettle and stop looters even before the actual protective structure. Imagine a kind of castle full of spikes and warning symbols at this point, whose outposts in front of it already tower into the sky in a similarly thorny form with a threatening silhouette.

[32] Pluschkovits, Atom Bombs, p. 57; Benjamin, Walter, The Origin of German Tragic Drama, 1928, p. 178.
[33] Bastide, Francoise & Fabbri, Paolo, Lebende Detektoren und Komplementäre Zeichen: Strahlenkatze, brechendes Auge und Atomsirene, 1990, p. 87.
[34] Lem, Mathematische Kodierung, p. 80.
[35] Voigt, Vilmos, Konzentrisch angeordnete Warntafeln in zunehmend neueren Sprachformen, 1990, p. 123-124.
[36] See Posner, Mitteilungen an die Ferne Zukunft, 1990, p. 44.
[37] Posner, Mitteilungen, p. 45-46.

It is precisely this principle, whether consciously or unconsciously, that the *Fallout* games utilise to identify a nuclear-relevant building as such from afar. Within the game world, this has a defensive effect: the buildings, most of which were used for military purposes, did not allow civilians to enter when they were active and should therefore appear as unattractive as possible to them. However, this has the practical primary effect on players that a silhouette on the horizon (as well as a representative symbol in the compass, usually the three-beam atomic symbol) as a landmark indicates that this is a potentially valuable looting object that, depending on the game, has special resources or even a detonatable missile (in *Fallout 76*). The principle of clearly visible nuclear threats through architectural shapes is thus turned on its head in the game design: Not as a deterrent, but precisely to attract interested players. This is powerfully illustrated by the Sentinel Site Prescott, which is relevant to the story of *Fallout 4*: the military base was the main target of the nuclear missile strikes that characterise the game world before the story begins and is therefore located in a completely contaminated area known in the game as the 'Glowing Sea'. Sentinel Site Prescott consists of several brutalist, cubic concrete cooling towers arranged in a circle around an enormous concrete pyramid, from the top of which nuclear missiles can be fired. The pyramidal bunker shape of this nuclear base is unique in the game series. In order to obtain nuclear warheads for the newly built super mech Liberty Prime in one of the later main quests of *Fallout 4*, players must infiltrate the bunker with the help of radioactively shielded protective clothing or armor[38]. Here, too, the deterrent effect of the monumental building is subversively utilised for the game design: The pyramid shape, which only partially stands out from the yellowish-green fog of the Glowing Sea depending on the viewing angle, lures players in with the promise of unique and narratively relevant loot.

Atomic Priesthoods

As can already be seen from the description of the constantly expanding shield monument in chapter Monuments, Writings and Signs, several proposed methods of the HITF required the transmission of work instructions or explanations into the distant future. Sebeok[39] proposes the use of a hierarchically organised dynasty of initiates, who are provided with specific scientific problems and instructions from the time before the apocalypse in a special bunker or through oral transmission to their descendants. As leaders or advisors to the leaders of the emerging forms of civilisation, these dynasty members are supposed to make entering dangerous areas punishable by law, renew warning signs if possible and commission the maintenance of sealing monuments or, as spiritual leaders, make the dangerous places taboo through annual defensive rituals, folklorisation or religiously charged prohibitions. Sebeok refers to this group of chosen ones as the 'atomic priesthood'[40]. Bastide and Fabbri attribute the advantage that these 'happy few'[41] have in passing on the warning to the socio-psychological characteristics of privileged people:

> "Of course, the elitist traits of such a society would help the latter to keep their secret in memory, because people tend to be conservative in terms of maintaining a certain privilege that distinguishes them from other earthlings."[42]

Two elements of this dynastic tradition can be found in the *Fallout* series, each in different forms: On the one hand, the idea of a selected group with access to the technological information of the past, which is given a guardian mission (or imposes it on itself), and on the other, the idea of a religious glorification of nuclear-contaminated places or the mechanisms

[38] Fallout Wiki, Liberty Reprimed.
[39] Sebeok, Büchse, p. 165-166.
[40] Sebeok, Büchse, p. 141.
[41] Bastide & Fabbri, Lebende Detektoren, p. 87.
[42] Bastide & Fabbri, Lebende Detektoren, p. 87.

that have led or could lead to contamination. In the world of *Fallout*, there are several factions whose different, often dramaturgically exaggerated world views are relevant to the playable story in most games, and which players can occasionally even join. Three groups in particular fulfil Sebeok's description.

a.) *Vault-Tec*: Firstly, there is Vault-Tec, whose members are the only one of the three groups in the games under consideration to have all died out and whose legacy consists primarily of the 'Vaults', i.e. underground bunkers, scattered throughout the game world. Before the nuclear war, Vault-Tec was given the government order to save as many US citizens as possible in massive underground bunkers in the event of an emergency. Every *Fallout* protagonist except the Courier in *New Vegas* starts out as a resident of one of these Vaults. But while Vault-Tec has certainly saved people from the nuclear apocalypse, most of the Vaults serve an additional purpose: almost all of them are part of a research project in which the occupants are subjected to various experiments. The hope of obtaining information about human behaviour, biological mutations, cryosleep and various other fields of research in order to rebuild the USA after the apocalypse has ironically not been fulfilled in the *Fallout* games, as Vault-Tec itself no longer exists; however, various of the Vault technologies and the derivation of the knowledge that Vault-Tec preserved for the future become important plot points in the course of many series titles. In a way, the Vaults can be seen as the guardians of science in the *Fallout* universe, as they protected civilian scientists on the one hand, and on the other, humanities such as sociology and psychology received special attention in the experimental setups within the Vaults. For example, Vault 21[43] directly beneath the Strip in Las Vegas used a gambling-based social structure to investigate the effects of gambling on the psyche of its inhabitants.

b.) *The Enclave*: The main antagonist in several storylines within the series is the so-called Enclave: the remnants of the legitimate US government who survived the catastrophe in isolated, insular groups in vaults or government bunkers. These may be ministers, high-ranking military officers or even just regional administrators, which is why the claim to legitimacy is usually questioned by rival factions. However, the Enclave sees itself as the guardian of order and the only true government of what remains of the USA, even where self-governing regions have established a new organisation such as California in the form of the New Californian Republic in *Fallout: New Vegas*. For example, part of the main plot in *Fallout* 3 is the Enclave's endeavour to install the most powerful CPU president possible in order to take control of the wasteland of the former capital Washington D.C.[44]. As surviving government bodies with knowledge of the pre-apocalyptic social structures and access to remaining technology such as power armour and Vertibird helicopters, the Enclave fits in well with Sebeok's definition of an atomic priesthood. It can serve as an example of how the greed for power of individuals or the conviction of wanting to establish authoritarian forms of society by force if necessary can corrupt the 'protective mission' that such a priesthood gives itself. It is thus the prime example in the *Fallout* series of the concern expressed by Bastide and Fabbri that a privileged group of conservative 'guardians of the Grail' could instead use their knowledge to seize power by "driving the initiates to megalomania through their specialness, or that in response to others' doubts, they use the deposits to terrorise their subordinate brothers and sisters"[45]. One of the main plot points of *Fallout 3* vividly illustrates this development, as the Enclave is portrayed as a racist, fascist autocracy: It wants to contaminate the waters of Washington D.C. with an adapted

[43] Fallout Wiki, Vault 21.
[44] Fallout Wiki, John Henry Eden.
[45] Bastide & Fabbri, Lebende Detektoren, p. 87; translated by me.

variant of a pre-war virus designed to kill all 'impure' creatures, from mutant ghouls to humans with a certain threshold of radioactive material in their bodies.[46]

c.) *Brotherhood of Steel*: The Brotherhood of Steel (BoS) is probably the most iconic 'atomic priesthood' in the Fallout universe. It consists of former officers and soldiers of the US military who came together after the opening of the Vaults in the post-apocalypse under the leadership of US military captain Roger Maxson, with the self-imposed mission of collecting and guarding all dangerous technology so that such a catastrophe could never happen again[47]. The founding of the Brotherhood is also accompanied by the non-recognition of the old order of the USA as the guardian of the remaining civilisation, which regularly brings the BoS into conflict with the Enclave in the games[48]. The Brotherhood has a strong hierarchical and authoritarian structure and is orientated towards the Latin motto 'Ad Victoriam' and the knightly order system of the European Middle Ages: The order is headed by a High Elder (initially Maxson), who is superior to several Elders, who in turn have differently orientated non-commissioned officers. In an audio diary from *Fallout 76*, Maxson explains the dual idea behind the seemingly archaic social order: the detachment from the failed idea of the USA and the motivation of his troops through a new, meaningful mythology:

> "Words have power [...]. They build identity. They take on a meaning if you keep using them, even if it didn't exist to begin with. It was the Knights and Scribes after the fall of Rome that protected what was left of Western civilization. So we are the new Knights and our role is similar. But we'll need more than names. We'll need new traditions, our own, well, mythology. Something people can believe to their core. [...] What else can I do? Declare myself President? Make you a Senator? Look around. Something's killing us more than the rads and freaks out there. Depression. People have lost everyone. Every goddam soul. Wives, kids, loved ones, heck even the mailman. We need to replace it with something otherwise people's souls will wither. We'll be little more than walking dead men."[49]

The resulting self-mythologisation externally and internally fits in with Sebeok's reference to the possible need to establish artificial myths and new religions or rituals. In a way, the BoS actually achieves exactly what Sebeok was trying to achieve by establishing a nuclear priesthood, namely to keep civilians away from nuclear waste disposal sites or military bases. The BoS systematically collects heavy equipment that could be used to break into such structures and seals them in its own bunkers, and also establishes its own bases at militarily relevant points, often old bunkers or military bases, so that the population of the various fallout wastelands no longer dares to go near them. Although the BoS is usually portrayed in more ambivalent tones in the *Fallout* titles than the quasi-fascist enclave, Bastide and Fabbri's concern about the megalomania of the privileged also falls on fertile ground here. In the *Fallout 3* add-on *Broken Steel*, for example, the player character can freely decide to permanently destroy one of several locations via orbital strike - including civilian targets[50]. *Fallout 76's Steel Dawn* add-on paints the Brotherhood in an even more ambivalent light: the Appalachian chapter of the BoS suffers the consequences of a serious decision here: in the run-up to the playable storyline, it had distributed experimental rocket launchers to settlers against the Elders' orders, which the Brotherhood had originally intended to lock away. When the settlers were routed, the weapons fell into the hands of raiders, who used them to establish a permanent military presence in West Virginia: The disregard for the chain of command and its consequences lead to the Brotherhood splitting

[46] Fallout Wiki, Take it Back!.
[47] Fallout Wiki, Roger Maxson.
[48] Fallout Wiki, Brotherhood of Steel.
[49] Bethesda, Fallout 76, quoted from Fallout Wiki, Audiolog: About the Brotherhood.
[50] Fallout Wiki, Who Dares Wins.

into several factions in the course of the add-on, each of which wants to enforce different visions of how to deal with civilians, using military means if necessary[51]. The uncontrolled enforcement of the law of the jungle under the guise of a self-imposed protective function for society has already been foreseen by Bastide and Fabbri in their criticism of the idea of an atomic priesthood, and in Latin that matches the Brotherhood's motto: 'Quis custodiet ipsos custodes?'[52] - who watches the watchmen?

d.) *Children of Atom*: The Church of the Children of Atom, usually shortened to Children of Atom or Atomites within the games, are in many ways the counterpart to Vault-Tec, the Enclave and the Brotherhood of Steel, and the bridge to Sebeok's theories brings to light what is probably the most satirically exaggerated version of an atomic priesthood among the four. Unlike the three previously discussed circles, the Children of Atom as a group neither emerge directly from groups in the pre-war fallout world nor are they formed from the survivors of a broken pre-war entity. They are therefore the only one of the four groups to which the conservative privilege described by Bastide & Fabbri as the 'happy few'[53] cannot apply. Moreover, the Children of Atom are not a technological or governmental organisation, but a religious one that has made the proverbial best of the destruction of the world by nuclear fallout: a god. The Atomites worship nuclear weapons, their detonations, the resulting mushroom clouds and the radiation released[54]. The core dogma is that radiation not only causes destruction, but also creates new life forms and worlds. The movement is decentralised and follows its own loose interpretations of this dogma, which leads to different manifestations in the various *Fallout* titles. The most famous occurrence of the sect is probably in *Fallout 3*, where Atomites have founded the town of Megaton around an unexploded bomb, worshipping it and asking for it to explode[55]. In *Fallout 4*, the Atomites settle in the impact crater of a nuclear-powered passenger plane, which they consider sacred, and in the ruins of a lighthouse that has been converted into a pilgrimage station for worshippers on their way to the crater[56].

In its encouragement to approach radioactive dangers, the religious glorification of the Atomites turns Sebeok's purpose of an atomic priesthood on its head. Ironically, since the Atomites as a religious community are the closest match to the literal meaning of Sebeok's composite term. However, as a decentralised, largely leaderless movement, the Atomites are the furthest removed of the four groups under consideration from Sebeok's substantive task of acting as a guiding group for their environment. Nevertheless, the Children are a suitable starting point for revealing atom-semiotic ideas in *Fallout*. The Atomites want to absorb the radiation and mutate into Glowing Ones[57], glowing green radioactive ghouls, a life form that comes impressively close to the biological warning against nuclear-contaminated places described in the next section.

Biological Codes and Radiating Cats

The HITF warning system that at the time of writing probably seems by far the most like literary futurism, was fittingly proposed in part by a science fiction author. Stanislaw Lem[58] envisages a 'circular self-renewal process' that works on a biological level. Specifically, encoding the warning message in DNA so that it is carried into the distant future via biological

[51] Fallout Wiki, Steel Dawn.
[52] Bastide & Fabbri, Lebende Detektoren, p. 87.
[53] Bastide & Fabbri, Lebende Detektoren, p. 87.
[54] Fallout Wiki, Church of the Children of the Atom.
[55] Fallout Wiki, Megaton.
[56] Fallout Wiki, Crater House; Fallout Wiki, Kingsport Lighthouse.
[57] Fallout Wiki, Feral Ghoul (Fallout 4), Glowing One.
[58] Lem, Mathematische Kodierung, p. 80.

reproduction processes. The warning in the form of coded base pairs could then be read by scientists in the future, if they analysed the coded organisms in the vicinity of the storage site. According to Lem, this would also require a kind of 'preface' on the gene strand that expresses the coding of the actual message in the form of mathematical formulas that would either still apply in 10,000 years' time or, even if the science of mathematics had fallen into oblivion due to the collapse of civilisation, could be deciphered again when the laws of nature and mathematical knowledge are rediscovered.

Also biologically reproduced, but visible without DNA decoding, Bastide and Fabbri[59] proposed a "zoosemiotic" solution: A "living radiation detector". An animal that would be genetically modified so that it reacts to the presence of radioactive radiation with clearly perceptible, presumably visually visible changes. Bastide and Fabbri propose cats as the carrier animal, as they have been domesticated since the time of ancient Egypt and it is relatively likely that they will still be found in the vicinity of humans in 10,000 years' time[60].

Bastide and Fabbri were not thinking of these 'radiant cats' as literally radiant, possibly greening fur, but of spots and marks on the skin, as they actually exist in the form of the genetic defect *xeroderma pigmentosum*[61] and could possibly be deliberately bred through gene splicing.

Introduced in *Fallout 4*, the game series takes a much more literal approach to a similar idea: creatures that come into particularly strong contact with radiation begin to glow green. Glowing Ones[62] can occur in many species depending on the game, but players usually encounter them in the form of particularly powerful wild ghouls, i.e. mutated humans who are no longer capable of reason. These Glowing Ones are precisely the objects of worship of the Children of Atom: end states that are attainable for humans and become desirable in the religion of the Atomites. Glowing Ones arise in particularly heavily contaminated places and usually gather packs of less contaminated ghouls around them, as they emit so much radioactivity that they turn the humans they encounter into ghouls - a process that cannot happen to players even with constant contact with Glowing Ones, however, and which has not been explicitly visible in any *Fallout* title to date. Glowing Ones are often used as mini-bosses in the game series and serve narratively as markers of particularly radioactive locations such as storage sites, nuclear power plants or nuclear craters. However, they are not suitable as warnings, as Bastide and Fabbri intended: they are too dangerous for prolonged contact with humans and have to absorb too much radiation in the first place to go beyond the stage of a ghoul to become the glowing green lighthouses that can be recognized as a warning signal from afar.

Concluding Thoughts

In conclusion, it is probably pointless to ask again whether the *Fallout* series, under the overwatch of Bethesda, deliberately addresses discussion points of atomic semiotics set by the Human Interference Task Force. Atomic semiotics is too much of a niche topic, even in its own scientific environment, as the HITF's proposals were never actually implemented, even if basic atomic semiotic ideas can be seen today in multilingual signage supplemented by symbols and images in almost all military locations worldwide. On the other hand, atomic semiotics is also deeply rooted in the cultural awareness that developed during the Cold War and beyond with regard to the dangers of nuclear destruction and the need for long-term storage solutions. There

[59] Bastide & Fabbri, Lebende Detektoren, p. 88.
[60] Bastide & Fabbri, Lebende Detektoren, p. 89.
[61] Bastide & Fabbri, Lebende Detektoren, p. 89; MedlinePlus, Xeroderma pigmentosum, 1990.
[62] Fallout Wiki, Feral Ghoul (Fallout 4), Glowing One.

is no nuclear use without nuclear semiotics, and accordingly no “retrofuturistically nostalgic, ironically distanced” (to bring up Pluschkovits' introductory quote once again) satire of a fictitious nuclear age like the one in Fallout.

However we actually deal with nuclear waste in 10,000 years' time, whatever warning and storage options we may use, there is no question today that repositories and missile silos are marked in some way as a warning and/or prohibition, whether we are aware of this as nuclear semiotics or not. And perhaps *Fallout*, in its existence as a video game, as an artistic and cultural asset, will at some point contribute to warning of the danger of nuclear contamination. Assuming that the global video game industry resolves its currently disastrous archiving situation[63] and the technology available in 10,000 years is able to launch video games from the 20th century, the artistic, playful exploration of the topic in all its ironic exaggeration could also create awareness in a future society for a problem that may have been forgotten until then. And with a bit of luck, this anthology will also still be available and readable.

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