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"URANIUM TO PLAY!": CHILDHOOD, MATERIAL CULTURE AND RADIATION IN THE MOST DANGEROUS BOARD GAME OF HISTORY (1950)

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ABSTRACT
This paper aims to analyze the concept of childhood in historiography, using the iconography available in documentation. From this perspective, we investigate the "Gilbert U-238 Atomic Energy Lab" toy, developed by the American Alfred Carlton Gilbert in the 1950s. Our investigation focuses on the relationship between childhood and toys, as well as examining the negligence of adults regarding the health risks associated with the production of toxic toys at the time. We adopted a descriptive, explanatory and qualitative methodological approach. We concluded that the game emerged in The Cold War context, reflecting the nuclear frenzy promoted by the US, even though it was aware of the risks of radiation. Gilbert, motivated by commercial interests, did not consider the health implications. The failure of sales can be attributed to marketing factors, such as the price of the set and the lack of professional association with the world of radiation.

Keywords: Cold War. Infancy History. Public Health. Radiation. Toys.

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INTRODUCTION

When we uncover images of toys produced in the 1950s in the United States, it becomes clear that, although childhood began to be perceived from the 17th century onwards, at least based on the line of thought of historian Philippe Ariès, the perception of the danger of using certain materials in the manufacture of toys, such as hydrocarbons and electromagnetic radiation, was still far from the imagination of individuals in the 20th century. Therefore, we will begin this discussion by presenting the concept of childhood in Western Europe, so that we can better understand the emergence of the perception of this stage of life and realize that even in the 20th century, not only was there no concern about the danger of using certain materials in the manufacture of toys, but there was also the risk of poisoning children, including adults, with such substances.

Childhood can be apprehended through the perceptions constructed by adults. Therefore, although we deal with the world of children in previous historical contexts, kids themselves have not been able to speak or defend themselves for a long time. If They could be listened, we would have a different view that was not reported by the ideas and representations of adults (Rocha, 2002, p. 52).

After presenting the concept of childhood, we will look at the relationship between children and toys in historiography, specifically in the 1950s. In this topic, we will understand that toys not only represent the kids universe, but also the world of adults, since it is they who manufacture these artifacts. However, it is through this materiality that children claim their own space, as well as It attends the expectations of a certain group of individuals, or even the desires of the society and time in which they live. On the other hand, despite being a product generated with defined intentions, when choosing a toy or the way how they will handle it, children are expressing their individual tastes. Toys represent a rite of passage (Kühberger, 2019, p. 1).

If toys are presented as an informal learning media, the board game that is going to be analyzed shows us another perspective. This game, created by the American entrepreneur Alfred Carlton Gilbert, was full of intentions. As It will be seen in more depth, when he invented this toy, Gilbert wanted to allow children to create and observe chemical and nuclear reactions using radioactive material (Moreira; Lincolins, 2024). Thus, the educational aims and desires of adults are reflected in this example of material culture. The relationship that children have with the toy is therefore shrouded in external intentions (Kühberger, 2019, p. 1)

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A brief introduction to the American inventor Alfred Carlton Gilbert is going to be given, highlighting his academic background, the historical context in which he was inserted and what his intentions were when creating this iconic game.

From this point onward, the research, will take a closer look at the game board. As we shall see, its design and production is intertwined with conceptions and projects of childhood, culture, society and education. It is important to note that when these board games began to be disseminated through their commercialization, the appearance of this type of toy was closely associated with the post-war period, where, in the United States, the status and role of the physicist began to change rapidly. This means that when historians examine the experiences of physicists in this period of the Cold War, they turn their attention to their role within the broader political sphere, as well as in low-level domestic activities on a smaller scale (Kaiser, 2004, p. 853).

The idea here is to show that in this period there was an interest for reflection and construction of the new American scholar image. Pedagogical activities provided post-war academics with the means to shape the disciplines. It is known that after the war, between 1945 and 1950, enrollment in physics departments grew almost twofold. Pedagogical issues took on a new significance for physicists (Kaiser, 2004, p. 853-854).

This indicates that the post-war context had a significant impact shaping intimate issues within the microcosm of childhood, such as toy choices (Kaiser, 2004, p. 853). After this explanation, we will discuss what the concept of illness was in the 20th century, since exposing children to radioactive materials seems to be a behavior which indicates that the mentality of these individuals was far from what is perceived today as public health.

THE CONCEPT OF INFANCY IN HISTORIOGRAPHY

It would seem rather strange to embark on a discussion about the concept of childhood in history without first delving into the perspectives presented by the renowned French medievalist historian Philippe Ariès. This is particularly important because he is considered the forerunner of the history of childhood. Ariès, through his meticulous examination and interpretation of various iconographic materials from the medieval era, spanning the 12th to 17th centuries, drew on the history of mentalities to affirm that the concept of childhood was historically constructed, since, for a long time, children were not seen as developing beings with their own characteristics and needs, but rather as miniature adults (Ariès, 1986, p. 55; 173; Rocha, 2002, p. 53).

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Ariès explains that it cannot be said that the ignorance of childhood was by incompetence or lack of skill. For him, it was more likely that there was no place for children in this world. In medieval paintings, children are represented as Ottonian[4] miniatures. This means that they were portrayed or represented as adults, but on a smaller scale, as we can see in the following painting by the Italian painter Duccio di Buoninsegna (Ariès, 1986, p. 50).

Figure 1 – *crevole madonna*, c.1284 (the virgin and the boy with angels).

Source: Crevole Madonna, c.1284 (A Virgem e o Menino com Anjos) (meisterdrucke.pt),

Theorists Moysés Kuhlmann Jr, Jacques Gélis, Daniele Alexandre-Bidón and Pierre Riché are other authors who offer a different perspective to the discussion. In their research, they try to prove that concern for children may have arisen before Modernity, as in the Middle Ages, unlike what Philippe Ariès proposed. For these researchers, the perception of childhood would have come from more remote times, because there was in fact a concern for their survival, education, religiosity, the body, food and, finally, care for

[4] An 11th century Ottonian miniature gives us the idea of a deformation that the painter imposed on children's bodies. This means that it seems very far removed from what we know and feel about the idea and appearance of childhood (Ariès, 1975, p. 39).

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learning, clothing and the manufacture of toys. Therefore, for these authors, Ariès' construction of childhood is generalizing and linear, as his research is only based on sources from noble families (Rocha, 2002, p. 53-58).

Ariès supports the idea that concern for childhood first arose among the wealthy, due to the particularization of the education of male children. The big issue is that popular historical sources were excluded from the analysis, something that is justified by the precariousness of their economic conditions. As a result, it can be seen that the nobility monopolized the promotion of concern for children, at least in Ariès' analyses (Rocha, 2002, p. 58).

The poor children, perceived among the people, would spend time in squares, at evening gatherings, dressed like adults. As the concept of shame was built up little by little, it can be seen that civilizing behavior was appropriated by poor children based on the attitudes of richer children. Therefore, learning took place in both families, but there were obvious differences, for example, in the quality of the toys (Rocha, 2002, p. 58).

There is no record or news of peasants or artisans recording their life stories during the Middle Ages. Similarly to France, in England during the modern period children were largely absent from literature. The child was a marginalized figure from adult life (Heyhood, 2004, p. 10). In the 13th century, the manners of children were attributed to feelings that came before reason and were not matched with good morals. It was the role of adults to develop character and reason in children (Caldeira, 2008, p. 3).

Another consideration raised by Ariès is that, at the time, the way children were viewed was quite superficial. This means that a certain amount of attention was paid to children in their early years, which he calls “pampering”. The child was treated like a little animal, a cute small thing. If the kid died, which often happened, some were heartbroken. But as a general rule, they did not care much, because another child would soon be on the way to replace them. This indicates that the child never left anonymity (Ariès, 1981, p. 4).

Following Ariès' line of thought, the “discovery” of childhood emerged between the 15th and 17th centuries, when it was recognized that children needed a period of preparation and appropriation of some essential and necessary skills in order to enter the adult universe (Heyhood, 2004, p. 23). This preparation phase was school. Between the 19th and 20th centuries, parents took an interest in the studies of their children, which indicated a new feeling towards children. The family began to organize itself around the child, so that it began to give the infant such importance that he or she left anonymity and

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became someone impossible to lose or replace. In the meantime, the number of children was limited in order to better care for those who had already been born (Ariès, 1986, p. 5).

The paradigm shift that formed a new conceptualization of childhood was precisely the idea that children were considered imperfect adults (Ariès, 1986). What we can see from Ariès' perspective is that children, between the 12th and 20th centuries, were in a state of fragility and devaluation. They were considered inferior beings who did not deserve any kind of differentiated treatment, which indicates that most of the time childhood was diminished so that it could be inserted into the world of adults (Barbosa; Magalhães, 2013, p. 3).

CHILDREN RELATIONSHIP WITH THEIR TOYS

A toy is a material that supports a game. Play, this recreational action, makes use of rules, which come from the social world. Therefore, no one is born knowing how to play. Playing presupposes social learning. In addition, it should be noted that for a long time, and even today, there has been a dichotomy in the construction of male and female roles which has a direct impact on prejudices over the use of certain toys, where gender stereotypes emerge (Kishimoto, 2001; Carvalho, 1999, p. 30).

The toy is a cultural materiality that has had and still has a direct impact on the lives of children. Toys have a timeless character. Despite the countless evolutions they have undergone, they still occupy a special place in children's lives. Our purpose here, however, is to discuss the quality of toys, since they contribute to cognitive, emotional and physical development on children (Vansdadiya; Vasoya, 2022, p. 320).

Toys from the 19th to the 20th century should be thought of in two categories: Physical items, which may be from the child's environment, and a toy that has been specifically designed for play. The toy, whether realistic or stylized, will represent the world of daily activities, such as playing or exploring (Vansdadiya; Vasoya, 2022, p. 320).

These items, when used by children, expose their actions, defining what type, style or how deeply they establish a relationship with this material. This means that there is a diversity of toys and each one carries a social, artistic and creative value that will affect the development of the child's play (Vansdadiya; Vasoya, 2022, p. 320). This impacts the constitution of the child's social identity (Chartier, 2002, p. 9).

French historian Roger Chartier states that the identities formation of individuals is related to every type of social code that can be thought of (Chartier, 2002, p. 9). Toys are part of this. Although the concept of childhood had already been consolidated in the 20th century, which is the period we are focusing on, if we think in terms of Ariès' time frame, when he attempted to create a toy that would require extremely advanced knowledge, he demonstrated that children would only have an identity if they were able to do things similar to those done by adults (Caldeira, 2008, p. 1).

Since the 18th century, scientific toys have been incorporated into the education of children' as recreational activities and hobbies. They were present in theatrical demonstrations and were an amusement in the Victorian world during the 19th century (Turner, 1987, pp. 377-378). Toys involving chemistry appeared at the end of the 19th century, when children were already seen as consumers of scientific knowledge at home. At the turn of the 19th to the 20th century, chemistry toys carried with them different policies and meanings that did not only concern play. Toys always say something more, they reveal the interests and projections of the adult world onto children. The representations are fun, but they show the idealization of other people, as well as typologies of childhood, ways of being a child and gender identification (Al-Gailani, 2009, p.372).

The board game, which will be analyzed shortly, had a dual purpose: It was educational and socializing, because it helped young people to become interested in real-world topics (Vansdadiya; Vasoya, 2002, p. 320). It is curious to reflect that toys emerged as items of entertainment for families, only to later become, in the second half of the 19th century, an educational tool that would arouse the interest of students (Al-Gailani, 2009; Turner, 1987; Brenni, 2012).

WHO WAS ALFRED CARLTON GILBERT?

Alfred Carlton Gilbert was born on February 15, 1884. In 1904, Gilbert, an experienced magician, athlete and businessman, entered the medical school of Yale with the aim of working as director of physical education. He spent his evenings performing magic tricks at parties and, in his final year, decided with a friend to form the Mysto Manufacturing Company, which sold magic sets in boxes (Connectcut History, 2018).

Gilbert was a talented athlete who won national competitions in wrestling and gymnastics while still a student. In 1908, he jumped 12 feet 7 3/4 inches, broke the pole vault world record and tied for the gold medal at the 1908 London Summer Olympics. As you can see, he was a person willing to immerse himself in various experiences (Connectcut History, 2018).

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In 1911, Gilbert began designing a toy construction set based on steel construction beams that he observed during a train trip between New Haven and New York. When Gilbert presented the "*Erector Structural Steel & Electro-Mechanical*" construction set in 1913, he was confident of the product's potential. As a result, Gilbert is often presented as a versatile and talented inventor who made several toys. Thus, he is credited with inventing the board game called "*Gilbert U-238 Atomic Energy Lab*" and the "*Erector Set New Haven*" (Connectcut History, 2018).

A RADIOACTIVE GAME IN THE PLAYING SPACE: THE "GILBERT U-238 ATOMIC ENERGY LAB"

As mentioned above, toys have objectives that range from playful proposals, involving entertainment, to the educational dimension, having a formative sense, in terms of socio-cultural memory. Every toy offers its user an imaginative process. However, the board game is a platform that involves a pre-established narrative and scenario. This means that this resource delimits a simulation for the user (Begy, 2015, p.1-3).

The idea of simulation in this case denotes the proposal to imitate traits, details and rules of reality on another scale, one that is specific to the limits and specifications of the game. If a board game aims to create a simulacrum of a slice of reality, this element of material culture has historicity, so that it dialogues with its context of production and periods of use (Begy, 2015, p.4-5).

As a medium that has a set of rules that aim to give dynamics to the game's narrative, this material translates to the user a scenario of its own, one that brings aspects of reality. It is in this sense that as an interactive and dynamic object that produces a simulation, the board game has an educational effect by transmitting its reality data (Rajković et al, 2019, p.2-4).

The uplifting essence of the board game accompanies it due to its dynamic operating structure. This is because, certainly as an active material, its origin is associated with leisure and entertainment (Rajković et al, 2019, p.5-8). Games practices are so old that they precede the oldest civilizations. The first records of the systemic use of games of this type are from ancient Egypt and Mesopotamia, around five thousand years old. Such models were related to cultural aspects of these civilizations, where the purpose of these materials was entertainment (Masukawa, 2016, p.4-10).

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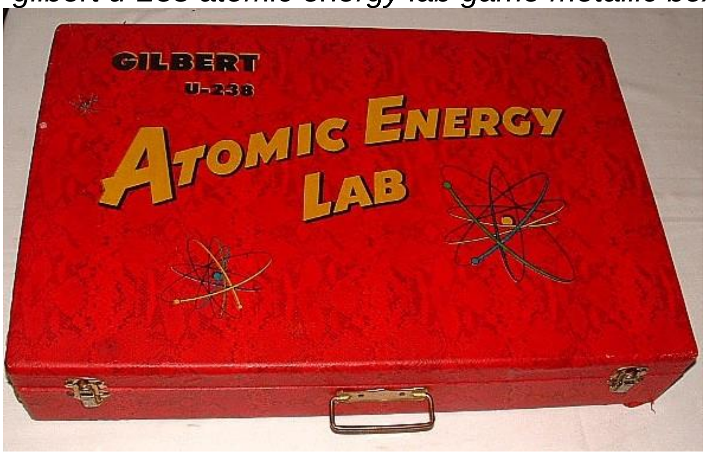
From the 19th century onwards, these games went beyond entertainment, gaining interest in terms of cultural transmission. This meant a process of instruction and instigation of the curiosity of individuals from early childhood, in order to lead and inspire these children to interests in everyday life and the specificities of the reality to which they were inserted (Vansdadiya; Vasoya, 2022, p. 320). The intentions behind the use of this type of media have only diversified over time, so that in the present day these materials are even used as direct education resources (Donovan, 2017, p.11-15).

Thinking specifically of the 20th century, in the American context of the 1940s and 1950s, board games were not intended as direct educational media. However, these products were certainly crossed by institutional and marketing interests (Begy, 2015, p.4-5). These are two aspects that become evident when we analyze the board game "*Gilbert U-238 Atomic Energy Lab*" which was launched in 1950 by A. C. Gilbert Company. This toy company had been producing board games involving chemistry, physics and engineering since 1916. The Atomic Lab was launched with the aim of instilling notions of radiation in young people, so as to encourage them to learn about these energy resources and their uses.

To think of the post-war world is to glimpse a reality marked, in its opening, by the stigma of the atomic bombs dropped on Japan in Hiroshima and Nagasaki, and by the formation of two conflicting power blocs: the Cold War was beginning. Given the competition between the USSR and the USA and the fact that the figure of the physicist had gained renown, investment in the exact sciences increased. The proposition to instill an interest in physics among children had become a state objective (Kaiser, 2004, pp. 853-854). It was in this context that Gilbert's nuclear energy laboratory simulacrum appeared:

Figure 2: gilbert u-238 atomic energy lab game metallic box (1950).



Source: https://techcrunch.com/2009/08/17/ebay-watch-mint-1949-atomic-energy-lab/

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Figure 3: box interior of *gilbert u-238 atomic energy lab* game (1950).

Source: https://encurtador.com.br/hxQuD

The figures show the game box, which was made of metal. The second image shows the resources available, from the equipment to the radioactive materials, such as uranium. The different devices had particular purposes, relating to aspects of radioactivity:

Figure 4: game equipment display manual (1950).

Source: https://gombessa.tripod.com/scienceleadstheway/id4.html.

The most eye-catching piece, and the one that allowed the observation of ionizing radiation, was the cloud chamber of Gilbert, where particles could be observed. With the chamber in operation, the user operated the Spintariscope, a resource that allowed them to observe the interaction of ionizing radiation. Before visual observation, the person used the

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Electroscope. This equipment ensured that the electrical charge in the chamber could be identified. Finally, the Geiger Counter was considered the game's safety device, as it measured the presence and intensity of ionizing radiation.

The radioactive sources ranged from Uranium 238 (a resource that influenced the naming of the kit) to sources containing Alpha, Beta and Gamma particles. A detail of the set that reinforces the institutional interest in inciting the taste for physics, as well as demonstrating the race and dispute for radioactive sources by the government, is the fact that Fig.4 contains a message indicating that a new legislation had been enacted, where the user could use the Geiger counter to find deposits of Uranium. If successful, he would receive 35 thousand dollars.

Deductively, it is easy to conclude that radiation was of use and interest in the 1950s, since, as mentioned, nuclear bombs had already been used. However, Gilbert's Home Lab was based on the idea of simulating a nuclear power plant on a small, simplified scale. Therefore, understanding the existence of this game requires a brief look back at the history of knowledge about radiation and nuclear energy.

The first contact with radiation occurred accidentally in 1895 at the University of Würzburg. Wilhelm Röntgen, studying cathode rays, had discovered X-rays. In 1896, French physicist Henri Becquerel tried to relate these rays to the luminescence of certain substances. While carrying out certain practices, Becquerel noticed that uranium salts left impressions on photographic plates. From then on, his interest focused on research into the diversity of radioactive resources (Calado, 2012, p.412-413).

Maria Sklodowska-Curie, in a complex misogynistic time, became interested in the world of radiation and discovered that uranium was not the only radioactive resource. Thorium, polonium and radium were radioactive substances discovered by the Polish physicist. While Curie began her studies at the end of the 19th century, physicist J. J. Thomson realized the existence of different types of radiation, proposing the existence of Alpha and Beta. If radioactive matter was discovered and uses were assigned (medical aspects and time measurement), it should be noted that the energetic nature of these resources assigned them new uses. Ernest Rutherford had envisioned that they could be energy sources. While the first three decades of the 20th century gave way to the planning of nuclear power plants, the political climate gave birth to atomic bombs through the Manhattan Project. Nuclear fission had expanded the possibilities (Calado, 2012, p.414-439).

The first definitive test of a working nuclear reactor took place in 1942 in Chicago, at a time when the US had entered the Second World War and was on a fast track for nuclear development. The room, known as the “Met Lab”, presented a definitive test run on December 2, 1942 at 15:25. The next three years saw the consolidation of the first bomb. The first test with this type of bomb took place on July 16, 1945 in Los Alamos, USA. In less than a month, on August 6 and 9, 1945, the US bombed Hiroshima and Nagasaki respectively (Calado, 2012, p.442-449). The human race's access to radioactive resources opened unavoidable doors.

Even though knowledge about the use of nuclear energy as an electricity production resource for civil society had existed since the 1940s, the first nuclear power plant was only inaugurated in 1954 in Obninsk, Russia. The advent of this type of energy production only took shape in the 1970s and 1980s, mainly after the oil crises (Char; Csik, 1987, p.19-22). Even though the diffusion of this energy industry occurred in a period after the release of the game (1950), the interest in the popularization of knowledge, and instruction, in relation to the theme of radioactivity already existed.

The excitement about nuclear power began in the scientific sphere before any civil and popular interest. Understanding the interest of the market and the U.S. government in proliferating notions about atomic energy requires comprehending another aspect related to radioactivity, which is the birth of the nuclear power plant. The perception that radioactive substances could be energy raw materials was not new at the end of the 1930s. However, it was the theoretical discovery of nuclear fission, in 1938, by Otto Hahn and Fritz Strassmann, in Nazi Germany, that opened the way for a practical and productive application of these substances as energy resources (Gowing, 1979, p.51).

Close to the war, a series of European physicists had realized the risk of using fission for the production of weapons. Uranium fission is only possible with 235 version, an isotope found in nature in a ratio of 1 to 140 in relation to the natural one, Uranium-238, and is therefore a rare resource. There was a climate of conspiracy and secrecy when the war broke out, however, both the US and the UK kept a number of confidential articles. The climate of secrecy in this period was not only between enemies, but also reached the sphere between allies. The use of this knowledge not only affected the sphere of warfare, but also the energy and scientific advances of other states. That is, there was a risk in the sense of competitiveness in giving up these secrets (Gowing, 1979, p.51-53).

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The U.S. only funded research on nuclear energy in allied territory in the post-war period. The new U.S. interest had centered on making electricity production from radioactive sources feasible, as well as convincing the population that such sources were safe. However, the first civilian contact with this type of matter took place through war. Popular perception was permeated by insecurity after 1945 (Gowing, 1979, p.54).

Despite the warlike use of radioactive sources in 1945, the 1942 "*Met Lab*" project in Chicago also shed light on the perception of the use of these sources for energy production. The document "*DOE/NE-0046: The First Reactor*"[5], produced by the nuclear energy division of the United States Department of Energy[6], it served as a report on what happened in Chicago. This material highlights that in 1942 humanity for the first time produced, in a controlled manner, a nuclear chain reaction. In this process, Uranium-235 undergoes fission of its nucleus, an event that releases a large amount of thermal energy (Washington D.C., 1982).

Chicago's "*Met Lab*" was just the triggering factor in the consolidation of the nuclear plant for electrical production. In 1946, the "*Atomic Energy Act of 1946*"[7] was enacted in the United States. This document transferred the responsibility for nuclear technology from the military sphere to the civilian field. A series of military pressures fostered the use for the civilian sphere as a way to improve nuclear technology. Between 1946 and 1950, the business community debated the uses of these sources, so that they sought to flourish this energy industry, in order to make it a profitable business, and to the same extent applicable to the reality of the population (Clarke, 1985, p.475-478).

The first attempts at international regulation of nuclear uses started with the foundation of the United Nations Atomic Energy Commission in 1946[8]. Its initial proposal was to contain the spread of war uses of atomic energy. Despite attempts, this commission was finalized in 1949, the year in which the USSR tested its first bomb of this kind. The loss of the U.S. monopoly has opened up the possibility for other nations to use this type of energy. The next eight years were complex, since international atomic control devices did

[5] This document was produced in 1982 by the United States Department of Energy, specifically by the Office of Nuclear Energy. DOE is short for Department of Energy. NE concerns Nuclear Energy. The set of abbreviations next to the numbering names a series of documents that were generated by this institution. In this case, document number 0046 is a report on the first nuclear chain reaction.
[6] *Department of Energy* – Nuclear Energy (DOE/NE).
[7] Legislation on Atomic Energy from 1946.
[8] The abbreviation is UNAEC.

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not show results. The change of horizon took place in 1957 with the foundation of the International Atomic Energy Agency (IAEA) (Finscher, 1997, p.18-31).

The IAEA's proposal was to ensure, and proliferate, the peaceful use of atomic energy, in order to discourage any military use of weapons of mass destruction. Although the IAEA only emerged in 1957, the peaceful use of this energy, which is aimed at civil electricity, had already been operationalized between the years 1951 and 1954. The document "*DOE/NE-0088: The History of Nuclear Energy*"[9], produced by the nuclear energy division of the United States Department of Energy, proposed a history of the uses of nuclear energy. In this document there is a brief record commenting on the first functional nuclear reactor, which had an experimental sense. That was the "*Breeder Reactor I*"[10] which was built in the city of Arco, in the state of Idaho, in 1951. It was able to activate four light bulbs (Washington D.C., 1995, p.13).

Despite the long advance of the USA in the military and civilian use of nuclear energy, the first functional atomic power plant, which in fact sustained the urban electricity of a city, was inaugurated in 1954 in the city of Obninsk, former USSR (Zheludev; Konstantinov, 1980, p.34-35). This aspect demonstrates that the dissemination of knowledge, and uses, of atomic resources conquered the globe and went beyond the sphere of US monopoly.

The game "*Gilbert U-238 Atomic Energy Lab*", launched in 1950, was born at a time of military and energy competitiveness in relation to radiation. Fission was already known, bombs had already been dropped on Japan, and the search for the functional consolidation of nuclear power plants was in strong demand. The children's nuclear science kit had necessarily appeared with the intention of popularizing scientific notions about radiation among the masses, specifically the middle-class groups.

The government was interested in this type of promotion for two reasons. The first has already been highlighted, being the fact that this energy was born stigmatized due to the use of bombs. Therefore, it was necessary to expose the beneficial, and curious, use of radiation. The second issue concerned the competitive climate inaugurated in the recently emerged Cold War. If physics had been the cause of the Allied victory in World War II, it would be the guide to future progress. Nuclear energy seemed to be the field that provided

[9] Document produced in 1995 by the U.S. Department of Energy, specifically the Nuclear Energy Division, with the intention of expounding a brief history of Nuclear Energy.
[10] The text reads as follows: "1951 December 20 - In Arco, Idaho, Experimental Breeder Reactor I produced the first electric power from nuclear energy, lighting four light bulbs" (Washington D.C., 1995, p.13).

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solutions to the existing adversities. Therefore, it was important for the government to democratize radiation technologies and science as a way to instigate children's curiosity about this field. It would be a kind of indirect institutional investment, which counted on the business community, in the education and instruction of this subject.

This issue is not merely speculative, since Gilbert reported the state's interest in the development of this science kit, due to the fact that the government had reinforced constructive features of the set for the public understanding of atomic energy. In his 1954 autobiographical work, "*The Man Who Lives in Paradise*", the businessman expressed his feelings towards the game, reporting that he considered it to be the most spectacular educational toy of its time (Gilbert; Mcclintock, 1990).

These aspects demonstrate that the game appeared to have a strong commercial potential for the period. This is either for the thematic appeal, or for the investment and propaganda in relation to the set. However, there are two issues, which appear to be contradictory, that need to be raised. The first is the fact that if this game had such an appealing theme, why did its production ended in 1951, a little more than a year after its release, a fact reported by Gilbert (Gilbert; McClintock, 1990). The second aspect concerns the public health dimension. How the U.S. government allowed, in 1950, radioactive resources to be acquired by family homes, this at a time when different harms of radiation were already known.

THE 1950 U.S. CONCEPT OF HEALTH AND THE CLOSURE OF THE ATOMIC KIT

Thinking of a global medicine at the beginning of the twentieth century is a complex process since the globe did not have the levels of integration, or cooperation, existing in the Present Time. However, since the end of the 19th century, the medical field has been presenting new contours in the western world. The bacteriological revolution, the search for epidemic control and new medical techniques involving radiation marked the first half of the 20th century. Medical research had become a field in evidence. Among the verifications in the 1910s, the work of Paul Ehrlich is interesting because radioactive agents were perceived as cells destroyers. The German physician based on observations about chemical and radioactive agents in the development, and evolution, of cancer in animals (Porter, 1999, p.533-577).

The first fifty years of the twentieth century were the stage for new demands in relation to the functions of nation-states. The different governments, whether in the US or the UK, were required to guarantee care and health for the population. The right to health was of interest to governments, since a mass of healthy workers meant the guarantee of an upward productive rhythm (Rosen, 1994, p.353-359). This state role meant not only guaranteeing the cure of diseases, but to the same extent preserving the state of health. It is in this sense that a series of limits, in relation to certain substances, were consolidated in the twentieth century.

In the 1940s and 1950s, medicine already had a relevant degree of instruction on the harm of radiation. Whether in Ehrlich's works, or in Marie Curie's own life, affected and injured by radiation, the evidence of risks in relation to radioactive contamination became concrete (Kelly, 2010, p.48-53). The discovery of the X-ray by Wilhelm Röntgen was as rapid as was the appearance of the risks of atomic energy. In 1896, the British physician Hall-Edwards, responsible for the first clinical X-ray photograph in history, had developed hand cancer, hair and nail loss, due to the continuous photographic work with his patients. In principle, there was no consensus that these adversities came from radiation, however, research between 1895 and 1925, the latter the date of the first international congress of radiology, led to the conclusion that radiation generated wounds and skin burns, in addition to being a carcinogenic matter (Kardamakis et al, 2023, p.9-11).

The question raised from the 1920s onwards by radiation protection organizations was about what would be the safe level of exposure in relation to such substances. The possible testing was based on the observation of erythema, that is, reddish spots on the skin. In 1934 both the International and American committees on radiation protection defined a new unit, the Roentgen, to define a dose of tolerance in relation to human contact with radiation. The measurements were between 0.1 and 0.2 Roentgen per day for the whole body (Lindell, 1996, p.86). Concerns continued to escalate upwards in the following years, reaching complex situations, such as the Manhattan Project tests. With the dropping of the atomic bombs on Japan, both the international community and the U.S. were alarmed by the consequences of radiation. This led to the founding in 1946 of the *National Committee on Radiation Protection* (NCRP), an institution that proposed reducing the daily radiation tolerance dose (Walker, 2000, p.7-10).

The NCRP was under pressure from geneticists, such as H. J. Muller, regarding the tolerance dose. Muller in his research had reported that the cells, in their variety, had different degrees of radioactive resistance. Any dose would be dangerous, so instead of tolerance, the paradigmatic change led to the proposal of a maximum dose. The NCRP

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decreased year by year the amount that had been approved in 1934. Interest in civilian application grew in the post-war period and a series of serious long-term hazard tests were carried out with the intention of assessing the risks of radioactive matter in more detail. Between 1946 and 1953, the government was also interested in delimiting the risks to children. Tests were carried out on students with intellectual disabilities at the Walter E. Fernald School, without explaining the dangers to the parents. In 1950 the risks to children were already partially known, so it was already understood that these individuals had greater sensitivity to radiation (Walker, 2000, p.10-17).

Radiation-related risks were already understood in the governmental sphere when Gilbert's atomic kit was put on the market. It was certainly known that uranium 238 was much less dangerous than its isotope 235. The isotope 238 emits only alpha rays, which cannot pass through the skin. In this way, the U-238 was allowed to be marketed in the toy. However, Alpha particles are extremely violent to internal tissues, so if ingested or inhaled they become harmful.

The kit came with four uranium 238 ores, but next to these fragments there were also the sources emitting Beta and Gamma rays. The game came with smaller amounts of the Beta and Gamma sources. However, these rays are particularly dangerous, as they both pass through the skin, just as they are all carcinogenic.

The set came with three manuals. One of them explained how to use the equipment. The second is a kind of comic book, where nuclear fission was explained. Finally, the third and last contained information about uranium and radiation, delimiting how to handle it, and what its dangers are. The kit was dangerous because it contained different types of radioactive rays, which were risky both internally and externally to the body. The sources that the set had in fact did not emit alarming amounts of these rays. However, prolonged contact with such resources could be extremely harmful to children, a fact that was already known, and tested by the government.

Even if Gilbert's company asserted, and reinforced, the security of this toy, it is impossible to propose that the institutions of government were unaware of the risks involved. If the set was risky for children, what was the reason for its approval? This question raises two complementary explanatory paths. As mentioned earlier, the period following World War II led to nuclear competitiveness. The climate of paranoia aroused by the bombs, led to contradictory and dangerous choices by state institutions. In this sense, the “democratization” of radioactive facts through a game was a kind of indirect investment

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by the U.S. state in children's interest in nuclear energy, a science that was coveted and envisioned by the government to be progressed in the medium and long term.

The second explanation concerns the capitalist business logic, where demands for profit and productivity are constant. The A. C. Gilbert Company was for more than thirty years a company specialized in creating, producing and marketing toys and games related to scientific themes. In this industry there is always a demand for launching new products, since each toy has a period of peak and decline in sales, which leads to the closure of productions. Each company seeks to deal with the demands and pressures of a given time. Gilbert's company took advantage of the twilight of the 1950s and decided to release a game that was related to the nuclear frenzy in which the U.S. was deeply envolved. This collaboration between the State and the company was intended to be beneficial to both institutions. To the state it was a way of instigating radioactive knowledge, while for Gilbert it was a lucrative source.

Apparently, the government preferred to take a risk, little known in popular circles during that time, rather than prohibit access to radioactive sources. In other words, there was state permission for thousands of American families to acquire, and introduce into their homes, radioactive compounds, since the product was seen only as a harmless toy, due to the way it was advertised. This feat took place in the name of the idea of accelerating nuclear progress through the creative-imaginative promotion of children in relation to the theme. Speculating this scenario becomes less conspiratorial when the Walter E. Fernald School is arised (Walker, 2000, p.10-17).

A final topic involving the game "*Gilbert U-238 Atomic Energy Lab*" envolves the reason for the rapid decay, and closure, of the production and sale of this game. The launch in 1950 and its discontinuation in the following year demonstrates that this product was a failure. To propose that this was due to some kind of State or popular fear does not fit into this equation. A small portion of civilians knew the dangers of radioactivity. Meanwhile, consumer protection measures regulating toy safety were negligible in the U.S. in 1950. Concerns seem to have emerged acutely only in the 1960s (Ligon, 1965, p.596-597).

The Federal Hazardous Substances Labeling Act (FHSLA) from 1960 sought to catalog and limit the access to and sale of a number of substances and chemicals that were determined to be hazardous to public access (Ligon, 1965, p.597). However, the concrete and effective prohibition of the sale of toys, or children's products, that contained dangerous

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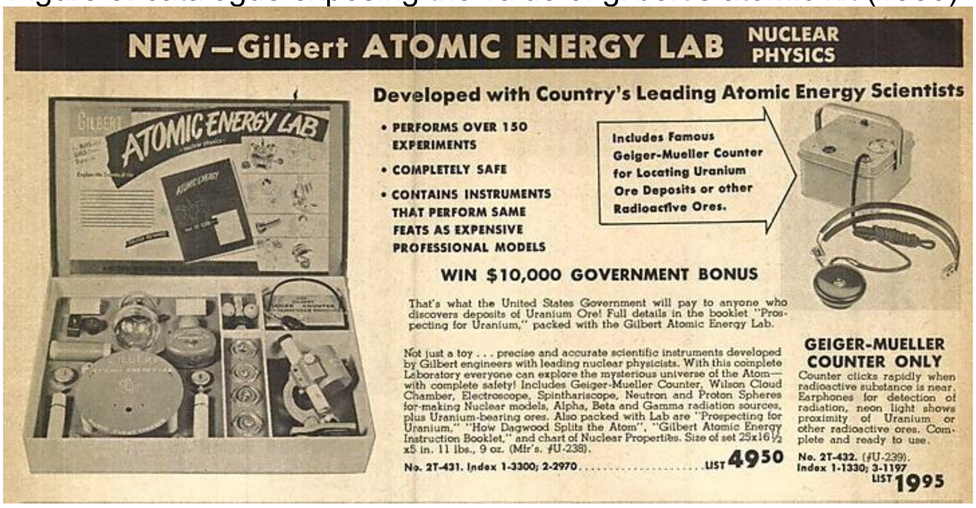
substances happened with "*The Child Protection Act of 1966*" (Washington D.C., 1966). The loopholes in this decree were solved in its new versions, those of 1969 and 1976.

The justification for the failure of sales is closely related to a marketing issue: The price of the set. In a catalog from 1950 it is possible to notice the game being advertised for the value of 49,50 dollars. When looking at the inflationary data provided by the *Bureau of Labor Statistics*[11], This value would be around 650 dollars in updated September 2024 values.

Figure 5: catalogue exposing the value of gilbert's atomic kit (1950).



Source: https://gombessa.tripod.com/scienceleadstheway/id4.html.

Through the "*Consumer Income Report of 1952*", a document that dealt with the minimum wage and household income of the USA in 1950, it is evident that Gilbert's atomic game was inaccessible to the vast majority of families. The median household income that year was around 3,153 dollars for white families and 1,569 dollars for non-white families. However, the total number of households earning up to 4,000 dollars was 25.1 million out of a total of 39.8 million. This means that 63% of the families were in a situation in which health, education, food, and other dependencies compromised a large part of their income (Washington D.C., 1952, p.1-10). These data demonstrate that Gilbert's atomic kit was only affordable for high-income families, not being accessible to more than half of the population, thus being an expensive product.

In the period between 1950 and 1951 there were other board games, or kits, that encompassed the theme of science. Gilbert's own company had great success with the line

[11] Bureau of Labor Statistics, In: https://www.dollartimes.com/inflation/inflation.php?amount=50&year=1950.

of kits known as “Erector Sets”, which lasted for more than fifty years. These sets involved the area of civil engineering, bringing issues of electricity and mechanics, being sold for prices much lower than the atomic set. This means that, whether in Gilbert's company or in his competitors, there were other products that fostered scientific creativity and were significantly more economical.

If the price was a major obstacle, the issue of reference and identification with the product in the popular imagination must be elaborated. The “*Gilbert U-238 Atomic Energy Lab*” sold less than five thousand copies, according to Gilbert (Gilbert; McClintock, 1990). Despite the limited public who was to purchase these kits, the low number of purchases shows that there are complementary elements to this failure. One of these is the reference that civilians had in relation to nuclear notions. For the masses, radiation was a little-known matter, which, despite being curious, it did not arouse associations that other fields of science provoked.

This means that there was a deficit of identification with the product. The kits that involved engineering, mechanics, architecture, electricity or water aspects, all involved associations with professions, and therefore future careers, known by the parents, who were the buyers of these toys. By purchasing a product of this type, families not only wanted to entertain their children, due to the playful condition of the toy, but to the same extent it was a form of investment in children's interest in the world of scientific knowledge, that is, a way to captivate future professional interest since childhood. The lack of professional association with the world of radiation blocked the interest of parents in acquiring this product.

CONCLUSION

From the concept of childhood presented at the beginning of this article, it is possible to observe that, although historian Philippe Ariès has argued that the perception of childhood emerged between the fifteenth and seventeenth centuries, theorists such as Moysés Kuhlmann Jr., Jacques Gélis, Daniele Alexandre-Bidón, and Pierre Riché offer an alternative perspective, indicating that this notion may have older roots. In addition, they maintain that Ariès based his conclusions predominantly on documents that recorded the experience of the nobility, which may limit the scope of his analysis.

By presenting several perspectives that contextualize the relationship of children with toys throughout history, we show that toys constitute a cultural materiality that exerts, and

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continues to perform, a significant influence on children's lives. Despite the innumerable transformations that toys experience, they maintain a timeless character, occupying a privileged space in children's lives (Vansdadiya; Vasoya, 2022, p. 320). In addition, toys transcend their playful function, as they reflect interests and projections of the adult and institutional worlds, offering a synthesis of the social and cultural interactions that permeate the children's universe (Al-Gailani, 2009, p.372).

As situated, the game "*Gilbert U-238 Atomic Energy Lab*", released in 1950, was born at a time of war and energy competitiveness in relation to radiation. Fission was already known, Atomic bombs had already been dropped on Japan, and the search for the functional consolidation of nuclear power plants was in strong demand. The children's nuclear science kit had necessarily appeared with the intention of popularizing scientific notions about radiation among the masses, specifically the middle-class groups.

The government was interested in promoting the use of nuclear energy for two main reasons. First, it was necessary to reverse the stigmatization of radiation, which was associated with atomic bombs, by emphasizing its beneficial use. Second, in the context of the Cold War, physics, which had contributed to victory in World War II, was seen as an engine for future progress, with nuclear energy being considered a solution to various adversities. Thus, the government sought to democratize access to technologies and knowledge about radiation, stimulating the curiosity of young people and making an indirect institutional investment that involved the business sector in education on the subject.

The problematization in this article is the fact that, in the 1940s and 1950s, medicine already had a relevant degree of instruction about the harm of radiation. Whether in Ehrlich's works, or in Marie Curie's own life, affected and injured by radiation, the evidence of risks in relation to radioactive contamination became concrete (Kelly, 2010, p.48-53). The discovery of the X-ray by Wilhelm Röntgen was as rapid as the appearance of the adversities of atomic energy.

Although in 1934 both the international and American committees on radiation protection defined a new unit, the Roentgen, to define a tolerance dose in relation to human contact with radiation, where the measurements were between 0.1 and 0.2 Roentgen per day for the whole body (Lindell, 1996, p.86), as pointed out, the NCRP was under pressure from geneticists, such as H. J. Muller, in relation to the tolerance dose. Muller in his research reported that the cells, in their variety, had different degrees of radioactive resistance, any dose would be dangerous, therefore, instead of tolerance, the paradigmatic

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change led to the proposal of a maximum dose. Thus, in 1950 the risks to children were already partially known, so that it was already conceived that these individuals had greater sensitivity to radiation (Walker, 2000, p.10-17).

Two points must be considered for the sale of this game at the time. The climate of paranoia that the bombs aroused, led to contradictory and dangerous choices by State institutions. In this sense, the “democratization” of radioactive facts through a game was a kind of indirect plan by the state in children's interest in nuclear energy, a science tought that would grant a brilliant future. Another reason concerns the capitalist business logic, where demands for profit and productivity are perpetual. It is because of this that Gilbert's company decided in 1950 to release a game that was related to the nuclear frenzy in which the U.S. had been promoting.

As explained, the decline in this game’s sales was not due to security reasons. Concerns like this seem to have emerged acutely in the 1960s. The justification for the failure of sales is closely related to the price of the set. Gilbert's atomic game was inaccessible to the vast majority of U.S. families (Ligon, 1965, p.596-597). The deficit of identification with the product by the majority of the population was another big issue. The lack of professional association with the world of radiation, during the 1950s, seems to had obstructed the interest of parents in acquiring such a product.

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