A Comparative Analysis of the Justifications for the McMaster Nuclear Reactor Across its History

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Abstract

The McMaster Nuclear Reactor (MNR) is one of four nuclear research reactors in Canada and the only one located on a university campus. When construction finished in 1959, it was the seventh university research reactor in the world. Over the interceding decades, societal perceptions of nuclear science have gone through several distinct periods. As a long-established reactor in a residential area, the MNR is a useful case study showing how global events and scientific developments can shift public opinion. Using meeting notes, speech transcripts, and newspaper articles from the McMaster archives and online databases, the image of nuclear research in society can be compared between decades. These sources consistently described the same benefits of nuclear research at McMaster throughout its history, namely its benefits for education, medical research, and its relative safety. However, the factors which received the most focus changed as global support for nuclear research fluctuated. Upon its inception, the MNR benefitted from a global interest in nuclear science and its potential for education was deemed exciting. After the nuclear disasters at Three Mile Island in 1979 and Chernobyl in 1986, constant reminders about safety mechanisms at the MNR eased paranoia. When the future of the MNR was in question in the 1990s, its isotope production for cancer treatments became instrumental in keeping it operational. The effectiveness of these arguments is paramount for researchers today as McMaster continues its research into Small Modular Reactors, which may be used to generate energy in similar residential environments.

Introduction

The McMaster Nuclear Reactor (MNR) plays a unique role in the field of nuclear science. As one of only four research reactors remaining in Canada and the only one on a university campus, it is a key facility for training nuclear scientists. It also produces neutrons

for private laboratories and isotopes used for a wide range of medical treatments. It began operations in 1959 when nuclear research was an exciting scientific frontier that the majority of society welcomed. With its existence spanning over sixty years, these sentiments have not remained as widespread or as intense. Controversies with nuclear warheads and power generation seriously impacted the momentum that nuclear science experienced in the 1950s and 1960s. Globally, these setbacks limited public approval and government funding for nuclear energy facilities. Although the MNR does not produce energy, its operations have still been affected by both of these issues during distinct periods of its history. Its location in a residential area differentiates it from other nuclear reactors in Canada, giving McMaster students and Hamiltonians a local anchor for global conversations about the safety and practicality of nuclear energy and research.

Literature Review

There is very little literature describing the history of the MNR, as most papers mentioning the reactor focus on specific functions of the reactor and the experiments that benefit from its presence. However, there are many different papers which describe the MNR and Canadian nuclear reactors in a wider context. For instance, the reactor has played a pivotal role in many different eras of McMaster's history, so any paper outlining the general history of the campus since the 1950s would likely mention the MNR. An excellent example of this is *McMaster University: A Chance for Greatness*, a series of books commissioned by McMaster University to provide an overview of the notable events and narratives that have shaped the university. Volume 3 describes the years 1957-1987, making it particularly useful for those interested in the nuclear reactor. The book focuses on the campus as a whole and does not put much emphasis on the research or backlash received by the MNR. However, the unique advantages and challenges associated with the MNR were discussed in the chapter "Great Balls of Fire," emphasizing that McMaster University focused on ensuring that

McMaster students and Hamilton residents were comfortable with the safety mechanisms.[1] They hosted many guided tours of the MNR to help advertise their efforts, and the versatility of the reactor quickly became apparent. The book attributed the acquisition of the MNR to the prestige and expertise of Henry Thode, whose accomplishments were well regarded across Canada.[2] Under his supervision, McMaster helped set the first measurements of isotope abundances after nuclear fission processes. The university was also the first to study the yields from spontaneous fission of uranium and thorium atoms.[3]

The other angle from which secondary sources can describe the MNR is by explaining how the rest of the world viewed nuclear technology. *The Rise of Nuclear Fear* by Spencer R. Weart is an excellent source for context about how society shifted away from excitement about nuclear advancements and towards extreme paranoia about the destructive capabilities harnessed by nations. It is written in an accessible style for those without any formal education about nuclear physics, with a particular emphasis on politics and pop culture.[4] This makes it a useful resource for anyone interested in learning more, which is very important for such an abstract and important field. Weart investigated the strategic promotion of constructive uses of nuclear research by American president Dwight D. Eisenhower in his "Atoms for Peace" speech and demonstrated that it advanced peaceful uses of nuclear technology. He showed how these ideals were reflected in American culture and how the media portrayed the eventual distrust of Americans in nuclear energy. Even though Canada and America have similar cultures and their politics affect each other, *The Rise of Nuclear Fear* only references Canada to complement the overall narrative about the United States.[5]

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[1] James G. Greenlee, *McMaster University: A Chance for Greatness*, vol. 3 (McGill-Queen's University Press, 2015), https://books-scholarsportal-info.libaccess.lib.mcmaster.ca/en/read?id=/ebooks/ebooks3/upress/2015-07-15/1/9780773582682#page=1.

[2] Greenlee.

[3] Henry G Thode, "The Early History of Nuclear Research at McMaster," 1987, Henry Thode Fonds Box 35, McMaster University Archives.

[4] Spencer R. Weart, *The Rise of Nuclear Fear* (Harvard University Press, 2012).

[5] Weart.

This is still useful when evaluating general sentiments surrounding nuclear technology, especially when anti-nuclear movements gained traction among McMaster students in the 1970s and 1980s. However, its applicability is limited to a supporting role since it does not discuss events at the university.

The most accessible information about the MNR can be found on the "Nuclear @ McMaster" website, and this is likely the only place where most students and Hamiltonians without a scientific background would be able to find information directly from the team at the MNR. Though the website can be difficult to navigate, it contains most of the information that anyone may be curious about and presents it in a simple and understandable way. Information about the isotopes it produces, reassurances about the reactor's safety, and public disclosures about events at the reactor can all be found on the website.[6] It also includes an "Our Story" tab, consisting of a timeline of key events in the reactor's history along with interesting photographs (Figure 1). It successfully describes the process of construction and conveys the excitement that surrounded the reactor in the early years. However, this is an imperfect source for information because they are biased only highlighting the best moments in the history of the MNR while downplaying any issues. In this case, the effects of global distrust of nuclear technology and McMaster's funding troubles throughout the 1980s and 1990s are ignored, despite their massive impact on student perception of nuclear research.[7]

[6] "Home - Nuclear @ McMaster," accessed October 10, 2024, https://nuclear.mcmaster.ca/.
[7] "Home - Nuclear @ McMaster."

Figure 1: Image of the MNR being constructed, right before the concrete is poured.[8] *They poured all of the concrete for the walls in one pour, taking 50 hours.*[9]

Despite the useful information contained in these sources, their limitations must be addressed. The fact that the history of the MNR is not the primary focus of any accessible secondary source is a problem for anyone curious about learning about such an influential reactor. Canadian reactors only get scattered and brief mentions in *The Rise of Nuclear Fear*[10] while *McMaster University: A Chance for Greatness* does not go in-depth about the history of the reactor.[11]

Methods

This paper focused on investigating how McMaster students and Hamiltonians perceived the MNR and how reactor staff attempted to communicate with them. The periods of time receiving the most attention were chosen because they featured the most discussion

[8] McMaster University, *Concrete Walls* [photograph], April 9, 1958, https://nuclear.mcmaster.ca/constructing-mnr/.
[9] "Concrete Pours," *Silhouette*, October 25, 1957, 28 edition, McMaster University Archives.
[10] Weart, *The Rise of Nuclear Fear*.
[11] Greenlee, *McMaster University: A Chance for Greatness*.

around the MNR at McMaster. A wide range of archival sources were expected to provide information which would complement each other. The William Ready Division of Archives and Research Collections at McMaster contained records about operations at the nuclear reactor, financial reports, and transcripts from speeches about the MNR, found in repositories like the Henry Thode fonds and McMaster University collection. These archives also included information about opinions about nuclear technology, found in McMaster's student newspaper, *The Silhouette*, and campaign posters from various anti-nuclear movements during the Cold War. Online databases included further information about public opinion in Hamilton and across the country through archived newspapers like *The Hamilton Spectator*. *The Silhouette* proved to easily be the best source for information about student perceptions of the reactor. Between the news updates, editorials, and interviews, a variety of emotions and justifications were captured. Though the number of articles about the MNR and nuclear technology fluctuated significantly between years, this information alone helped reveal when students were not interested or concerned about nuclear research at McMaster. Since many of the stories in *The Silhouette* included interviews with MNR staff or described their science communication strategies, these were also able to describe more than just student reactions. Meanwhile, there was very little discussed in other newspapers like *The Hamilton Spectator* which was not covered in *The Silhouette*. Their editorials could have been useful for describing the wider context of nuclear optimism and paranoia in Canada, but the same sentiments and reasoning were used by McMaster students. Therefore, stories printed in additional newspapers were used to supplement the stories in *The Silhouette*, instead of their originally expected role of being equal. With digital archives, the search terms used included "MNR", "nuclear technology", "McMaster budget", and combinations of these terms. Since physical copies of *The Silhouette* were used for this research, specific terms were not used to search for articles. Instead, article headlines were manually inspected to quickly evaluate

whether they discussed topics pertaining to nuclear reactor operations and sentiments on campus.

Reactor Excitement, 1955-1960

The origins of nuclear science are rooted in warfare, with the development of the atomic bomb during the Second World War. The power wielded by Little Boy and Fat Man when they were dropped on Hiroshima and Nagasaki respectively in 1945 captured the attention of the world. The terrifying amount of destruction changed diplomacy forever and spurred the arms race that fueled the Cold War. The tension between the United States and the Soviet Union paired with the rapid development of their nuclear weapons instilled a fear of world destruction into society.[12] It was with this context that American President Dwight D. Eisenhower delivered his famous "Atoms for Peace" speech to the United Nations in 1953. Eisenhower sought to ease the paranoia overtaking American society and replace it with optimism for a peaceful future. He highlighted the potential for the use of uranium for energy and encouraged more transparency about nuclear research on more beneficial uses.[13]

In a paper written by Thode in 1987 about the early history of the reactor, he explained that the reactor at Chalk River was increasingly being used by students in the program to supply their experiments with neutrons. He also mentioned other universities in the United States which were considering adding a nuclear reactor to their facilities. Another event he mentioned was the push to produce more isotopes for Canadian industries and local hospitals, which helped fund reactor operations. Thode acknowledged that the very early history of nuclear science at McMaster, immediately after the Second World War, was not well remembered by many. Research in Europe and at Chalk River drew some members of

[12] Weart, *The Rise of Nuclear Fear*.
[13] Weart.

the nuclear science program away from McMaster, but those who stayed held the first nuclear chemistry conference in the world after the war in 1947.[14]

At this point, McMaster was much smaller than it is today. The university had only moved from Toronto in 1927 and the first buildings dedicated to the sciences were built in the early 1950s. In particular, the Nuclear Research Building opened in 1951 and the Physical Sciences Building (later renamed Burke Science Building) opened in 1954. This only happened once McMaster started receiving government funding and they began investing in their science and engineering programs. The McMaster Nuclear Reactor (MNR) was one of these investments that would not have been possible without the momentum McMaster was building in their STEM programs.[15] They also announced and constructed a new engineering building (now the John Hodgins Engineering Building) at the same time. Hamilton had already been a major industrial city with a large steel industry, making McMaster an obvious location to develop future engineers.[16]

For the aforementioned reasons, the construction of the MNR was a very important event for McMaster during the late fifties. The initial plans for the reactor were announced publicly on October 23, 1956.[17] A column posted in *The Silhouette* that week explained that the $1,300,000 cost would be covered by "the Federal Government, the Province of Ontario, and private industry." Three sentences were dedicated to explaining that the swimming pool design is safe and has been proven to work in Geneva. Apart from that, the rest of the column described the process of planning the reactor, the nuclear research which had already been happening at the university, and the great potential for education and research that the reactor will provide. It specifically cited McMaster's location and expansion into STEM as the

[14] Thode, "The Early History of Nuclear Research at McMaster."
[15] "Atomic Research Grows: Reactor Heads Expansion Move," *Silhouette*, October 26, 1956, 27 edition, McMaster University Archives.
[16] Greenlee, *McMaster University: A Chance for Greatness*.
[17] "Atomic Research Grows: Reactor Heads Expansion Move."

reasons why the university was chosen to be the first university reactor in the country.[18] In a separate story in the same issue, these justifications were expanded on. It also described the processes involved with making the swimming pool design safe, namely that the water serves to both protect the people operating the reactor from radiation and to slow down the chain reaction caused by nuclear fission. It reassured the reader that if something malfunctioned and extra neutrons and energy were added to the system, it would cause the water to boil, thereby removing the substance which maintained the chain reaction. Since the MNR was not designed to generate power, the excess heat and energy would be removed through cooling towers.[19] One month later, a similar story made the cover of *The Silhouette*. This time, it announced more specific plans for the timeline of reactor construction. Citing the McMaster University President at the time, Dr. Gilmour, the reactor would be operational by the summer of 1958. Once again pointing to its benefits for training nuclear engineers and performing research, the MNR was described as the "chief item in a new $5,000,000 expansion programme for the University".[20]

The next construction update in *The Silhouette* was almost one year later, on October 25, 1957. It included quotes from Dr W.H. Fleming, the superintendent of the reactor. He highlighted the same benefits that it will provide by mentioning "it can be used for research work and will encourage engineering students to attend McMaster".[21] The story also described the same safety measures provided by the swimming pool design. While Dr. Fleming may not have intended anything specific beyond simply describing its benefits, it can be inferred that those in charge of the reactor project would have been focused on keeping excitement and support for the project. Before any of this was mentioned, it was

[18] "Atomic Research Grows: Reactor Heads Expansion Move."
[19] "Reactor Will Herald New Scientific Growth," *Silhouette*, October 26, 1956, 27 edition, McMaster University Archives.
[20] "Nuclear Reactor Plans Announced: Ready By 1958 - Dr. Gilmour," *Silhouette*, November 23, 1956, 27 edition, McMaster University Archives.
[21] "Concrete Pours."

revealed that construction was behind schedule after hitting the water table while digging out the foundation. While the initial estimate for completion was in the summer of 1958, it had now been pushed back to fall of 1958.[22] A separate article written in the same issue described at length the processes which would occur in the nuclear reactions, explicitly for readers without a scientific background. The effect which this had on its readers is unknown, but the article explained that many lay people were scared and suspicious because of the political and potentially dangerous aspects of the topic.[23] A follow-up article written the next week continued by describing how the process will be maintained at the MNR specifically. It went on to explain that the reactor will affect everyone by explaining some of the frontiers being explored by nuclear researchers at the time.[24] It can be speculated that this is contrary to how the majority of students and faculty at McMaster today feel about the reactor. While producing isotopes for various purposes is very important for the MNR in the twenty-first century, students wary about nuclear research may remain against it since it is not necessarily relevant for their careers and the research could be done elsewhere.

On February 14, 1958, *The Silhouette* reported that McMaster's Department of Medical Research led by Thode would provide radioactive isotopes for St. Joseph's Hospital. McMaster had been working to find methods to produce isotopes as well as discover potential uses for them in their Nuclear Research Building. The agreement signaled that McMaster expected its new reactor to be able to produce a large volume of useful isotopes for medical treatment.[25]

Two weeks later on February 28, 1958, *The Silhouette* reported on a seemingly massive issue which occurred during the construction of the reactor. The reactor pool, the volume of which is critical for safely maintaining the chain reaction, was too small to contain

[22] "Concrete Pours."
[23] Don Smith, "Nuclear Reaction Clearly Explained," *Silhouette*, October 25, 1957, 28 edition.
[24] "Atoms Explained," *Silhouette*, November 1, 1957, McMaster University Archives.
[25] "Medical Research Opens Department To Use Isotopes," *Silhouette*, February 14, 1958, McMaster University Archives.

the reaction. One nuclear researcher at McMaster and a leader throughout the construction project, Dr. Leeming, did not mince words when he explained, "[t]here is a good chance that the girls in both residences would be sterilized within 24 hours".[26] This was notable because on several occasions the swimming pool design had been touted as completely safe. Even though the danger came from an engineering flaw that could be solved, it would undoubtedly still have been unnerving to read what could have happened had the issue gone unnoticed. Any students living on campus may have remained nervous after the announcement, fearing that a similarly dangerous flaw could have accidentally been approved. However, since this error was caught, it seems that McMaster University and *The Silhouette* were mostly concerned about the cost of fixing the issue, which the massive headline stating "$500,000 Error" implied. The article centred around the fiscal problem that this created and described the potential solutions. The expected result for many, it seems, was for the building to be converted into an air conditioning unit at an additional cost of $500,000. The article did not describe the cost of fixing the reactor pool area specifically, but it did repeat that the overall cost of the reactor was $1,600,000. Since the governments and industries which provided funding would have demanded compensation if it was not completed, these prices were large factors in the decision to continue construction for the reactor.[27]

The final *Silhouette* update before construction was completed occurred on January 9, 1959, three months before its opening. In it, the staff in charge of the reactor were announced, with Thode as the head supervisor.[28] Apart from this, there were no *Silhouette* articles written about the rest of the construction process, including how the aforementioned construction error was resolved. Bizarrely, it was not covered by *The Hamilton Spectator* or mentioned in any other available records, with *McMaster University: A Chance for Greatness* speculating

[26] "$500,000 Error: Girls In Trouble," *Silhouette*, February 28, 1958, 28 edition, McMaster University Archives.
[27] "$500,000 Error: Girls In Trouble."
[28] "Reactor Staff Chosen with Dr. Thode as Head," *Silhouette*, January 9, 1959, 29 edition, McMaster University Archives.

that this may have simply been written by a nervous student.[29] Reactor officials had been attempting to spread messages about the safety of the reactor, and the article about the supposed construction error demonstrated that even though the public generally trusted nuclear technology at this time, there were still some who were concerned.[30] Furthermore, the official opening of the nuclear reactor was also not covered by the student newspaper, despite being a major milestone in the university's history. Instead, the University made it an integral part of their March 1959[31] and June 1959[32] Alumni News booklets. The former in particular emphasized the safety of the MNR, describing the same safety mechanisms as were previously emphasized by university officials. It successfully portrayed the opening of the reactor as an exciting event which even garnered the attention of the Prime Minister.[33] In the latter booklet, the events of the opening were given focus rather than any benefits of the reactor itself, even including transcripts for the speeches delivered by Prime Minister Diefenbaker and Thode. Both had an extremely optimistic tone, with the Prime Minister characterizing the reactor as a "symbol of mankind's quest for peace and an assertion of faith in the constructive benefits of science."[34] At a time when nuclear science was viewed as a route to a better future, Prime Minister Diefenbaker expressed his appreciation for the expanded role that Canada would play with this reactor. Meanwhile, Dr. Thode outlined the history of nuclear science at McMaster to that point to emphasize his own and the university's contributions to the field. He also thanked many government and private organizations for their support in funding the project, describing the reactor as a worthwhile investment for all.[35]

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[29] Greenlee, *McMaster University: A Chance for Greatness*, 29.
[30] Greenlee, 29.
[31] "The Reactor Is Ready for Its Work!," *McMaster Alumni News*, March 21, 1959, McMaster University Archives.
[32] "Prime Minister Diefenbaker Came to McMaster for the Reactor Opening," *McMaster Alumni News*, June 22, 1959, McMaster University Archives.
[33] "The Reactor Is Ready for Its Work!"
[34] "Prime Minister Diefenbaker Came to McMaster for the Reactor Opening."
[35] "Prime Minister Diefenbaker Came to McMaster for the Reactor Opening."

Despite the gaps in news updates from the perspective of students, the information that the articles conveyed is still useful for understanding this period in McMaster's history. The addition of a reactor to a Canadian university was very exciting, and Dr. Thode received praise for overseeing such an important project.[36] Safety was clearly important for students, but the main benefits highlighted by the university were the reactor's anticipated effects on their STEM research, as well as the potential benefits of products with medical and industrial uses. These factors remained important for the reactor, but they became less relevant to the average student as time passed. McMaster University kept constructing buildings as it grew and the MNR received less attention from students and the general public once it opened. However, global controversies and fears about nuclear technology started to turn McMaster students against the reactor.

Reactor Paranoia, 1978-1987

In contrast to the excitement and enthusiasm surrounding the opening of the MNR, by the late 1970s nuclear research had a tainted image. The general public had become less focused on the benefits of nuclear energy and research since it stopped getting coverage in the media. This combined with the decades of paranoia caused by the arms race between the United States and Soviet Union created an environment where Canadians, particularly university students, distrusted the government with nuclear research. These issues were exacerbated by troubling and highly publicized nuclear meltdowns at Three Mile Island in 1979 and Chernobyl in 1986. While the MNR was generally free from the same criticisms that energy generating nuclear power plants faced, the field of nuclear science suffered greatly and this indirectly harmed the MNR.

[36] "Prime Minister Diefenbaker Came to McMaster for the Reactor Opening."

The Research Report written for December 1980 described how the reactor had operated over the prior three years. The reactor was running 5 days per week apart from a two week stretch in January 1979 for beam port upgrades and a two month stretch in early 1980 for pool maintenance. The report also explained that political factors made it difficult to obtain fuel, so the reactor ran at 2 MW for most of the period instead of its maximum output of 5 MW. The situation was even dire enough at times where it ran at only 1 MW to conserve fuel.[37] The same report written a year later mentioned that 86 groups from universities, private laboratories, and government agencies used the reactor during a year-long period. These groups predominantly used either the beam ports or sampled isotopes.[38]

On September 28, 1978, *Silhouette* writer Richard Feenstra reported that McMaster was planning to partner with a private laboratory to help with funding the MNR. The National Research Council had identified the MNR as an indispensable research device, motivating McMaster to keep it fully operational as often as possible. Notably, the same story also mentioned that McMaster reported a budget surplus of $500,000 for the 1977-78 academic year.[39] Yet, only two months later in November 1978, *The Silhouette* announced cuts to science and engineering grants. It did not mention the nuclear reactor, though it did mention that funds in the future would be allocated more towards research with immediate results. It can be presumed that since nuclear research was not listed among the programs receiving funding cuts, along with the neutrons and isotopes it produces, funding for the reactor was not affected.[40]

An interesting altercation between anti-nuclear protesters and the government occurred in October 1978 when thirteen members of the Ontario Non-Nuclear Network

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[37] "McMaster University Nuclear Reactor Research Report: December, 1980" (McMaster University, Hamilton, Ontario, 1981), McMaster University Archives.
[38] "McMaster University Nuclear Reactor Research Report: 1981-1982" (McMaster University, Hamilton, Ontario, 1982), McMaster University Archives.
[39] "Mac Must Keep Reactor: BoG," *Silhouette*, September 28, 1978, McMaster University Archives.
[40] "Science and Engineering Grants Cut," *Silhouette*, November 2, 1978, McMaster University Archives.

(ONNN) attempted to seize documents related to nuclear accidents at Canadian power plants. They had been kept classified by the Atomic Energy Control Board (AECB), something which made citizens uncomfortable and was even questioned by some figures in the government.[41] This was one of several anti-nuclear protests which *The Silhouette* described to students during this period of wider nuclear paranoia.

It was in this wider context that later the same month *The Silhouette* published a large feature describing the general operations and procedures of the MNR, presumably for those without a formal scientific education. The very first paragraph is a quote from the MNR's Chief Reactor Supervisor, Peter Ernst about the absolute safety of nuclear reactors. Instead of discussing the specific measures taken at the MNR, he explained that nuclear reactors as a whole are regulated very closely due to the improbable threat of a mishap.[42] The majority of the feature explained how the neutrons created by the reactor were used in experiments at McMaster and beyond. However, it also discussed some of the downsides to nuclear research and power which were most commonly discussed at the time. Accidents or meltdowns were the first downsides mentioned, citing an incident at Chalk River in 1958 where a valve failure released high amounts of radiation inside the building.[43] This feature was written mere months before the incident at Three Mile Island which eventually escalated all of the concerns about safety. Next, the economic benefits of nuclear power versus conventional fossil fuel power plants were called into question. Finally, the disposal of radioactive waste was controversial due to the environmental contamination and possible risks to human health if dealt with improperly. The feature concludes by stating that the precautions surrounding

[41] "Nuclear Power and Reactor Safety Still Secret," *Silhouette*, October 12, 1978, McMaster University Archives.
[42] Jan Thompson, "Nuclear Energy on Campus: Beneath an Eery Glow," *Silhouette*, October 26, 1978, McMaster University Archives.
[43] Thompson.

nuclear reactors makes the chance of death incredibly small, while also predicting that the use of nuclear energy would grow.[44]

On December 7, 1978, *The Silhouette* reported that cracks had been found in cooling pipes in at least four nuclear power plants in Japan and West Germany. The National Research Council (NRC) explained that it was possible that since the pipes circulate the water required to remove excess heat from the system, a leak from these pipes could cause the core to overheat and melt down. The article was short and did not attempt to connect the cracks found abroad back to the facility at McMaster, but this is yet another story written by McMaster students reflecting that they were clearly concerned by nuclear technology in Canada.[45]

The field of nuclear science in North America received a massive blow to its public image on March 28, 1979 after the partial meltdown of a nuclear reactor at the Three Mile Island power plant in Pennsylvania. Fortunately no one was killed by the incident, but that did not stop those in the region and across the globe from viewing the meltdown as a dangerous and terrifying disaster.[46] While the optimism surrounding nuclear technology had clearly been overtaken by doubts and concerns long before this incident, this shifted the anti-nuclear movement in Canada and the United States to one propelled by distrust and paranoia, to one fuelled by fear. The human error and mechanisms which caused the failure at Three Mile Island were impossible at McMaster, something which MNR staff made abundantly clear to reassure McMaster students and faculty.[47] However, the distrust of nuclear technology among McMaster students and *The Silhouette*'s reporting on nuclear power worldwide did not change significantly. *The Rise of Nuclear Fear* describes the period

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[44] Thompson.
[45] "Questions Arise from Nuclear Leaks," *Silhouette*, December 7, 1978, 49 edition, McMaster University Archives.
[46] Mitchell Rogovin and George T. Frampton, Jr., "Three Mile Island: A Report to the Commissioners and to the Public," Nuclear Regulatory Commission Special Inquiry Group, January 1980, https://www.osti.gov/servlets/purl/5395798.
[47] "Sabotage Problem at U.S. Nuclear Plants," *Silhouette*, September 25, 1980, McMaster University Archives.

immediately after the accident as one where nuclear technology had a very bad image, but the heated debate that had surrounded it slowly dissipated after governments stopped building as many nuclear power plants. However, reactions from the public to any potentially dangerous mishap, no matter how small, were exaggerated compared to before the meltdowns.[48]

Another notable anti-nuclear protest in Canada occurred on October 13, 1979 when over 1,000 people marched on Parliament Hill in Ottawa. They were concerned that Canada was selling nuclear reactors overseas to unstable countries.[49] Another article describing an anti-nuclear energy conference was in the February 7, 1980 issue of *The Silhouette*, this time about a conference held in London, Ontario. Among the issues with nuclear energy mentioned, the piece focussed largely on the massive subsidies paid by the Canadian government to support the reactors and the sufficient amount of power generated from other sources at the time.[50] The potential to meet future energy needs by instead conserving energy which had previously been generated was used as another argument against additional nuclear power plants. The final justification against nuclear energy presented was the negative impact on health of radiation on those living nearby nuclear waste dumps, which were not always as regulated as they are today.[51] One week later, a student at Carleton University wrote in to describe a student conference held in San Diego that he wished to start in Canada. It was inspired by the Pugwash Conference from 1955, one of the most consequential and famous anti-nuclear conferences in history. The Canadian Student Pugwash group would work on similar initiatives, like promoting the consideration of a robust set of ethics in science and educating young people in Canada about the potential harms of nuclear energy.[52] A McMaster student named Ken McNaught wrote in the following

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[48] Weart, *The Rise of Nuclear Fear*, 225-27.
[49] "Nuclear Sales Attacked," *Silhouette*, October 26, 1979, McMaster University Archives.
[50] Ashok K. Goyal, "Nuclear Energy: A Technology Whose Time Is Past," *Silhouette*, February 7, 1980, McMaster University Archives.
[51] Goyal.
[52] Fraser Homer-Dixon, "Nuke Threat: Pugwash Conference Mandate," *Silhouette*, February 14, 1980, McMaster University Archives.

week to defend nuclear energy by refuting some of the claims made by the Carleton student. He explained that while solar and wind energy, which he proposed as alternatives to nuclear energy, are indeed safer, their variability makes them an untenable solution. He also added that nuclear energy is the cheapest source of energy at 2 cents per kilowatt-hour.[53]

On March 20, 1980, an article entitled "Dangerous plutonium shipment expected" was published in *The Silhouette*. It explained that a nine-kilogram shipment of plutonium would arrive in Montreal or Toronto from Europe to be used for experiments at the nuclear reactor in Chalk River, Ontario. It also mentioned that security was strict enough that even the AECB was not given information about the shipment. The rest of the article is speculation about the worst-case scenarios. Anti-nuclear figures feared that the plutonium could be seized by a terrorist organisation, who could then potentially create an atomic weapon. It explained that the risk of mass radiation poisoning caused by a plane crash motivated both American pilots to refuse carrying it and American president Jimmy Carter to ban the commercial use of plutonium.[54] While these are real concerns which deserve to be addressed, the small likelihood of anything of that manner occurring suggests such speculation was largely unwarranted. In fact, Ken McNaught, a student who had previously written to *The Silhouette* to defend nuclear research and energy, did so once again to address these concerns one week later. He explained that plutonium on its own is not as dangerous as it had been described and pointed out that a terrorist organization would simply not have the financial or scientific backing to be able to build an atomic weapon.[55]

Every year for the first issue in the month of April, *The Silhouette* transforms into *The Speculator* full of joke articles meant to fool the reader. In 1980, their front-page headline was "Three Mile University: Nuclear Disaster" with an image of the MNR tilted on its side.

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[53] Ken McNaught, "Nuke Naivete," *Silhouette*, February 21, 1980, McMaster University Archives.
[54] "Dangerous Plutonium Shipment Expected," *Silhouette*, March 20, 1980, McMaster University Archives.
[55] Ken McNaught, "Plutonium Shipments Not as Dangerous Are Sil Story Indicated," *Silhouette*, March 27, 1980, McMaster University Archives.

Upon reading the article, it is abundantly clear that the entire thing is a joke with interviews from "E.P. Gumby", "Ken Proton", and "MixMaster President Artie Borned".[56] Given that this was only one year after the catastrophic accident at the Three Mile Island reactor in Pennsylvania, an accident they referenced in both the title and the article, it is telling that the writers and editors at *The Silhouette* were comfortable joking about such a potentially serious topic. Students had clearly been concerned with nuclear power and research, as is abundantly clear from the increased amount of attention it received in the student newspaper. Of course, these prank issues were full of potentially upsetting articles, but printing a story about the MNR contaminating its surroundings during such a chaotic period for the image of nuclear research is a remarkable editorial decision.

On September 25, 1980, a short *Silhouette* story described that the United States had seen a growing number of cases of sabotage by nuclear power plant workers. Thousands of safety issues had been reported, with at least four major incidents proven to be deliberate.[57] A year after the incident at Three Mile Island, the news that some power plant workers had attempted to sabotage such important buildings would have been unnerving. This would have been doubly true for students at the university hosting the only campus reactor in the country. This fear was reflected in several issues of *The Silhouette* from the time. Massive features about nuclear fear, with varying degrees of speculation, were published in issues with attention grabbing titles like "Nuclear Terrorism"[58] and "Deterrence is flawed".[59] For the most part, these did not compare what they were writing about to the MNR or any activities at McMaster University. However, they still provide valuable insight about how students at McMaster were thinking about the field of nuclear physics and its applications. For instance,

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[56] Jeff Chickens, "Three Mile University: Nuclear Disaster," *Speculator*, April 3, 1980, V edition, McMaster University Archives.
[57] "Sabotage Problem at U.S. Nuclear Plants."
[58] Micheal Cnudde, "Nuclear Terrorism," *Silhouette*, May 22, 1986, 57 edition.
[59] James Young, "Deterrence Is Flawed," *Silhouette*, October 23, 1986, 57 edition, McMaster University Archives.

a full-page opinion piece entitled "Lessons from Chernobyl" was in the issue from July 24, 1986, three months after the catastrophic disaster.[60] It demonstrated a serious lack of trust in the governments, private corporations, and heralded "experts" in charge of regulating nuclear facilities. In particular, the threat of constant exposure to low levels of radiation emitted from nuclear power plants was presented as a terrifying reality which was being ignored by those in power.[61] These fears were emblematic of the global response to the Chernobyl disaster. Unlike the meltdown at Three Mile Island seven years prior, the Chernobyl meltdown resulted in several thousands of casualties and remains the costliest disaster in history.[62] It is interesting that in an editorial about these dangers, the presence of a nuclear reactor so close to where the article was likely written was not even mentioned. It did feature quotes from a professor in McMaster's Engineering Department, but these were all in defence of nuclear power as a whole in an attempt to clarify many of the concerns that Canadians had at the time. Essentially, the editorial showed that the general public was more influenced by the fear of an unavoidable sickness than arguments used by experts defending nuclear technology.[63]

On August 28, 1986, *The Silhouette* announced that the MNR would start being used to heat some buildings at McMaster. The plan was to redirect the energy which was lost from the system through the cooling towers. Notably, this would have been the first case in North America of a non-governmental nuclear facility used for central heating. The MNR manager stressed that the project was safe and would not interrupt regular operations and the article reiterated some of the same safety mechanisms that were highlighted earlier in the reactor's history, namely those which shut down reactions if it overheated.[64] This plan was not enacted

[60] Richard Leach, "Lessons from Chernobyl," *Silhouette*, July 24, 1986, McMaster University Archives.
[61] Leach.
[62] "Accident and Its Elimination," Chernobyl Nuclear Power Plant, accessed December 28, 2024, https://chnpp.gov.ua/en/about/history-of-the-chnpp/accident-of-1986.
[63] Leach, "Lessons from Chernobyl."
[64] Rita Pavelka, "Reactor to Heat Mac Buildings," *Silhouette*, August 28, 1986, 57 edition, McMaster University Archives.

because it was not seen as effective enough to warrant the cost.[65] One of the only other non-critical stories about the MNR during this period of *The Silhouette* was printed on October 16, 1986. Unlike most of the anti-nuclear articles in the newspaper at the time, this one glorified the work of Thode. Entitled "Thode made bomb possible; But says Canadians were working for peace," it summarizes some of his important accomplishments during the Second World War.[66] The intentions behind the title seem ambiguous at first glance as the first part is bold with a red highlight, making it fit in with many anti-nuclear articles of the time. It was clearly written for those with little knowledge on the topic, as the first section was dedicated to establishing that Dr. Thode was still active on campus at the time. The journalist interviewed Dr. Thode himself and included quotes about his work throughout the years. He had essentially been the head of the Chemistry Department since the onset of the Second World War and quickly built the first mass spectrometer in Canada and performed research on the fourth floor of Hamilton Hall. He accepted a role in an atomic energy project adjacent to the Manhattan Project at the University of Montreal after he previously declined a similar role in Tennessee. His work was still performed at McMaster, since the spectrometer he had already built was sufficient to help develop heavy water reactors, the focus of the Montreal project. His crowning achievement during the project was establishing the fission curve which the Americans were able to use to design their nuclear bombs. The article stressed that Dr. Thode's work and that of Canadians as a whole, was focused on atomic energy for peaceful times.[67] Student reactions to this article would have been fascinating, but none were ever published.

The Silhouette reported on a conference held in Edmonton during the weekend of November 8, 1986 which discussed Canadian policy on defence and nuclear armament.

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[65] Niall Whelan, "Reactor Renovations," *Silhouette*, February 5, 1987, McMaster University Archives.
[66] Bill Walker, "Thode Made Bomb Possible: But Says Canadians Were Working for Peace," *Silhouette*, October 16, 1986.
[67] Walker.

Organized in part by geneticist and activist David Suzuki, it drew 5,000 Canadians interested in denuclearization. The arms race and Canada's position between the world's two major superpowers had been creating a sense of nationalism among many Canadians. Among the proposals discussed at the conference were for Canada to leave the North Atlantic Treaty Organization (NATO) and the North American Aerospace Defence Command (NORAD). While neither of these came to fruition, the discussion still highlights the effect that rampant nuclear fear had in Canada.[68] The article written in *The Silhouette* did not explain whether nuclear research as a whole was discussed, nor did it attempt to connect the conference back to anything at McMaster.

On February 5, 1987, *Silhouette* writer Niall Whelan wrote that the MNR may undergo renovations to upgrade it to a Multi-purpose Applied Physics Lattice Experiment (MAPLE), a reactor designed in Canada. A MAPLE reactor had the possibility to increase the production of neutrons by eightfold while consuming the same amount of power. The upgrade was expected to cost $5,000,000, with contributions from the National Science and Engineering Research Council (NSERC) and local industries. Dr. D.R. Smith, director of the nuclear reactor, stated that only the core would be changed, and the building, pool, and safety standards would be left unchanged. However, many details about the proposal were in the preliminary stages and would require quite a bit of investigation to confirm.[69]

As part of an article entitled "A century of Mac headlines" in *The Silhouette*, this entire period was summarized by simply stating, "Contrary to today's attitudes, few concerns were raised when the [Honourable] John Diefenbaker officially opened McMaster's Nuclear Reactor in 1959".[70] Ultimately, decades of fear about nuclear war soured the image of nuclear research for most Canadians. Reflecting wider national and international trends, the safety

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[68] "True North Strong and Free? Nuclear Technology 'Totally out of Control' Says Suzuki," *Silhouette*, November 20, 1986, McMaster University Archives.
[69] Whelan, "Reactor Renovations."
[70] "A Century of Mac Headlines," *Silhouette*, March 19, 1987, McMaster University Archives.

and efficacy of nuclear power plants, along with the debate about nuclear armament, were discussed at McMaster during this time. Yet, there is little to suggest that the presence of the MNR influenced the views of students on these topics. The MNR was not frequently mentioned while discussing wider issues with nuclear research, even though many common concerns were present at McMaster. These included the fear of being subject to consistent doses of radiation, and discomfort with Thode's role in developing the atomic bomb during the Second World War.[71] Regardless, these concerns limited the support the MNR received from both students and the federal and provincial government. This led to a new threat to nuclear research at McMaster University: a lack of funding.

Reactor Uncertainty, 1989-1996

The fear of nuclear technologies weakened in Canada and across the globe as the tension caused by the Cold War faded away. While anti-nuclear campaigns still existed and were still mostly populated by young people, they did not appear in publications like *The Silhouette* nearly as frequently as they did in the prior decade. Where stories or editorials criticising the nuclear industry appeared in *The Silhouette* relatively frequently in the 1980s, they became almost nonexistent in the 1990s. The few articles that were written were instead focused on the MNR and the funding issues which had persisted. Throughout the 1990s, McMaster drew the ire of its students by progressively removing funding for various projects while also increasing tuition costs. It was within this context that the future of the reactor was in question.

On April 6, 1989, the frontpage of *The Silhouette* was dominated by a column titled "Funding pulled… Reactor to close." As previously mentioned, McMaster had submitted a proposal to upgrade the reactor core to a MAPLE design, which was originally expected to

[71] Walker, "Thode made bomb possible."

cost $5,000,000. However, this cost ballooned to $18,000,000 after considering the initial fuel and additional machinery. The Natural Sciences and Engineering Research Council of Canada (NSERC) ultimately decided not to provide the required funding because they deemed that the community using the reactor was ageing and the upgrade would not have been enough to elevate the facility to "top world level".[72] The Dean of Science, Dr. Ron Childs, advocated for the continued existence of the reactor by explaining that you cannot attract younger people without excellent facilities. He argued that the MAPLE upgrade would absolutely have been enough to make the reactor competitive globally. McMaster president Alvin Lee and chemistry professor John Greedan both added that this was simply part of a trend in Canada against the advancement of science, and the loss of the reactor would be a tough blow to the country's research capabilities. It would have forced the researchers and industries which relied on the MNR to switch to Chalk River, Europe, or the United States.[73] The application for this grant, written by Dr. Childs had emphasized the benefits to education, hospitals, and industries in Ontario in an attempt to justify the upgrade. It also mentioned that even ignoring the benefits of the MAPLE design, the process of upgrading the reactor would be a useful experience for the AECB, as they were attempting to market the MAPLE design worldwide. He hoped that the steep cost, which he understood would be a major concern, would be offset by contributions from the many corporations and government agencies which had benefited from operations at the MNR in the past.[74]

Nearly one year later on March 8, 1990, *The Silhouette* ran the headline "Federal budget cutbacks further strap universities." While it explained that programs were not expected to be affected, the budget was already very tight.[75] A few months later on October

[72] Adrian Humphreys, "Funding Pulled... Reactor to Close," *Silhouette*, April 6, 1989, 59 edition, McMaster University Archives.
[73] Humphreys.
[74] R.F. Childs, "The MAPLE Project," January 1989, McMaster University Archives.
[75] Brian Keenan, "Federal Budget Cutbacks Further Strap Universities," *Silhouette*, March 8, 1990, 60 edition, McMaster University Archives.

11, 1990, it was explained that the MNR was critically underfunded, putting its future in jeopardy. It also mentioned that due to its age, it would likely require upgrades to remain useful.[76] This pattern continued in February 1991 when it was announced that the Board-Senate Committee on Academic Planning (BSCAP) rejected a request for funding submitted by McMaster. The upgrade would have increased the power level from five to 12 megawatts at a cost of $76,000,000. Such an increase would have made it the top university research reactor in the world, which McMaster hoped would be an exciting enough premise to warrant the investment. However, they admitted that the political and economic environment was not ideal for raising such a large amount of money for nuclear research.[77] These articles reflected the growing concern about funding at McMaster, and the nuclear reactor was one of the investments at McMaster which suffered greatly.

An editorial in *The Silhouette* from November 28, 1991 argued that nuclear energy is safe and should be treated as such. Some of the biggest misconceptions held by the public, including the danger of radioactive waste, were briefly addressed.[78] Overall, this was a period with very little discussion about the MNR or nuclear energy at McMaster. Even after the seemingly major announcement that the reactor would close in 1989, this did not appear to be a large concern to McMaster students. However, it is also possible that students had simply accepted this reality, especially since there were several separate instances where the reactor was expected to close during this period.

Silhouette writer Jeff Pinto reported that the MNR had a mishap on January 4, 1994 while reloading fuel. Proper procedure had not been undertaken in order to speed up the process, but the power surged beyond the normal operating level. The automatic safety mechanisms in place effectively shut the system down, proving the safety of the reactor.

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[76] R.J. Stadus, "Feds Forego Nuke Funding," *Silhouette*, October 11, 1990, McMaster University Archives.
[77] Neil C. Levine, "Mac Reactor Upgrade Put on Hold," *Silhouette*, February 21, 1991, McMaster University Archives.
[78] Stephanie Palerme, "Nuclear Is a Safe Alternative," *Silhouette*, November 28, 1991, McMaster University Archives.

However, the negligence during operation was troubling. Additionally, they failed to notify either the AECB or the president of the University until several months had passed, which should have occurred immediately afterwards. Reactor staff were particularly concerned about following procedure after the incident since their operating licence was set to expire at the end of the year, at which point it would need to be renewed by the AECB.[79]

On January 26, 1995, *Silhouette* writer Russell Rogan reiterated that funding from the federal government had been slashed since more advanced reactors had been built that also required funding. This encouraged the reactor to seek additional income by producing and selling isotopes, specifically iodine-125.[80] It was once again explained that the reactor is important for research and isotope production, while it is also quite safe.[81] However, on September 14, 1995, writer Kathryn Hayward explained that the reactor was dangerously close to being shut down. With a yearly loss of $800,000 and progressively fewer students using it, the reactor was becoming difficult for the government to justify funding. Clearly, the government funding had been critical for its survival. The MNR was formally planned to be decommissioned in January 1996, though the nuclear physics department at McMaster was still hopeful that they could salvage the situation. The leading idea was to nationalize the facility, though there were no specific plans or proposals to do so.[82]

Around this time, physics department meetings about the future of the MNR and the details from these meetings are well documented. One meeting on May 19, 1995 featured attendees representing private labs, industries, and several departments at McMaster and other universities in Ontario. Amazingly, Thode attended this meeting and received notes from similar meetings, even though he was 84 years old. It was held "to provide a forum for all reactor users to express their views regarding the decision to cease reactor operations at

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[79] Jeff Pinto, "Reactor Fiasco," *Silhouette*, September 22, 1994, McMaster University Archives.
[80] Russell Rogan, "Reactor Reassessed," *Silhouette*, January 26, 1995, McMaster University Archives.
[81] Rogan.
[82] Kathryn Hayward, "Reactor to Take Final Bow," *Silhouette*, September 14, 1995, McMaster University Archives.

the end of this year."[83] All of the attendees were upset and frustrated that they were not made aware of the plans to close the reactor sooner, as they believed that they could help the situation. They understood that the financial issues were serious but felt that those in charge of the MNR had not highlighted its importance to Canadian science enough. Another issue brought up was that many of the researchers in Ontario which relied on the MNR, such as those at private laboratories, were unaware of the situation. The meeting was not entirely full of grief, because the attendants, particularly those from other universities and laboratories, were hopeful that a solution could still be found. It was suggested that the MNR could sell more isotopes, but many of the potential clients already had deals with other suppliers. Everyone also agreed to keep a list of those who attended the meeting so they could continue to communicate about the reactor, and they also believed that this could help them lobby for support from the provincial government and other organizations.[84]

An article entitled "Reactor's safety in question" was printed in the October 26, 1995 issue of *The Silhouette*, in which it was explained that the hospital's nuclear medicine department had been improperly handling radioactive iodine. The AECB threatened to temporarily remove their licence to operate with isotopes, but their importance for medical treatments spared the nuclear medicine department.[85] This turned out to be a controversial article as in the following week's issue, two different McMaster graduate students wrote two separate articles to clarify that the problem involved the hospital's nuclear medicine department, not the MNR. The headline suggested that the nuclear physicists at the MNR had been dangerously negligent, which both graduate students took issue with.[86] The health physicist who was quoted in the original article, Dr. John Harvey, clarified the situation in

[83] "Meeting of MNR Users Held at 2:00 PM on Friday, May 19, 1995. McMaster University, ABB 102" (McMaster University, Hamilton, Ontario, May 19, 1995), McMaster University Archives.
[84] "Meeting of MNR Users Held at 2:00 PM on Friday, May 19, 1995. McMaster University, ABB 102."
[85] Cheryl Clarke, "Reactor's Safety in Question," *Silhouette*, October 26, 1995, McMaster University Archives.
[86] Dave Kingdon, "Accuracy of Headlines Are in Question," *Silhouette*, November 2, 1995, McMaster University Archives; Joanne O'Meara, "Radiation Safety Story Is Inaccurate," *Silhouette*, November 2, 1995, McMaster University Archives.

one of the responses by stressing that this had no connection to the university whatsoever. The hospital got complacent about monitoring radiation exposure for staff, whereas university staff had always been very mindful about radiation exposure. Furthermore, the hospital staff members had not actually been exposed to excessive amounts of radiation, they just simply got lazy with their recordkeeping.[87] Overall, both response articles were very frustrated that *The Silhouette* did not take care to ensure that their stories were accurate, instead sensationalizing them.[88] One month later, a similar story to the original was published. Though the topic, water testing in the Biology department, is different from the radiation incident at the hospital, they each included large pictograms to draw the readers' attention. The radiation story featured the icon representing dangerous radiation and the water testing story featured a skull and crossbones icon representing death (Figure 2). This premise was also misleading since the story was about a program which had been running for three years to teach high school students how to test local water sources. The only mention of dangerous contents in the water was immediately followed by a sentence mentioning that authorities were quick to respond. Instead of outlining a danger to Hamiltonians as the large pictogram would make readers assume, the article described a positive contribution to society by McMaster students.[89] This suggests that the graduate students responding to the previous article were correct when they accused *The Silhouette* of fear mongering for the sake of entertainment. This entire saga of editorials demonstrated that while the MNR still had support on campus from those who understood its mechanisms, this did not represent the average student at McMaster.

[87] O'Meara, "Radiation Safety Story Is Inaccurate."
[88] Kingdon, "Accuracy of Headlines Are in Question"; O'Meara, "Radiation Safety Story Is Inaccurate."
[89] Scott Staring, "Joint Project Looks into Waste," *Silhouette*, November 23, 1995, McMaster University Archives.

Reactor's safety in question

CHERYL CLARKE
The Silhouette

The geiger counter is once again rising at McMaster.

"It was laziness, more than anything," said Senior Health Physicist at McMaster Health Physics, Dr. John Harvey. McMaster nuclear medicine staff failed to monitor their radiation exposure as carefully as they should have.

This breach of safety has prompted the Atomic Energy Control Board of Canada to question whether the centre will be able to continue to hold their licence.

During a meeting on October 17, the AECB threatened to temporarily withdraw the hospital's licence to use radioisotopes which detect thyroid problems.

"During a routine inspection...they [the AECB] checked the records and found that nuclear medicine and radio pharmacy were not in compliance," said Harvey.

The AECB discovered the centre did not have a suitable safety system in place, to ensure McMaster staff members handling the radioactive iodines were protected from dangerous exposure to radiation. Two previous inspections had shown similar results.

"The hospital wasn't paying attention to us," said Mike Taylor, the AECB director of materials regulation. "My reaction was to take some positive action to get this back into line," he added.

Since the inspection, the nuclear medicine department has put into place a better system with stronger quality control. As well, tests given to all the staff members involved with the radioisotopes show none have received too much exposure.

"Every day the area is checked for radioactive contamination and if there was a problem we would find it," said Harvey.

McMaster Hospital's nuclear medicine staff were concerned about the loss of the licence because it would mean that roughly 60 children and adult patients would have to go elsewhere for the tests.

In light of these circumstances, the AECB decided to defer their decision by a month. Another inspection will be conducted at that time to see if the centre is once again completing the safety checks.

RADIATION

Infractions

The hospital has a history of radiation infractions, including the improper disposal of a syringe which tripped radiation alarms in a Michigan waste facility.

Another incident in 1992 caused inspectors to find higher than normal radiation levels in a pathology labvone floor above the radiopharmacy lab.

In the same year, microbiology staff received unnecessary exposure to radiation due to unlabelled radioactive samples from the hospital's radiopharmacy.

"I have some grounds to doubt this [passing of safety checks] based upon past history," remarked Taylor.

Joint project looks into waste

SCOTT STARING
Assistant News Editor

What you don't know can hurt you.

For three years, OAC Biology students from six local high schools, in conjunction with McMaster, have been involved in a study programme testing the quality of water in local streams. Students participate in a 12 week lab course learning to measure phosphate and ammonia levels, hardness, and toxicity in water.

The research is aimed, in particular, at identifying harmful bacteria in the water, specifically Escherichia coli, an indicator of fecal levels.

A three–week field study lets the students put their newly–developed skills to work in the community testing local stream water.

The programme was developed in 1991 by Professor of Biology, Dr. George Sorger, and O. Zaimi, a Masters student doing research into community-oriented biology lab courses.

According to Sorger, the high school students' research "has had a profound effect on local communities."

The testing focusses on areas of concern for local people, primarily streams suspected of carrying dangerous levels of pollution. Findings from this research can offer communities a powerful tool for change.

"Once they have the information they are no longer the 'ignorant public' in the government's eyes and can force them to fix the problem," remarked Sorger.

According to Sorger, in some cases the students' work has been instrumental in prompting government action.

One group of Westdale students investigated a plume of grey water coming out of a pipe into Red Hill Creek, and found extremely high levels of fecal organisms. The finding was reported to the Friends of Red Hill Valley.

The local environmental group in turn alerted the proper authorities and the problem was corrected.

This summer a follow-up programme funded by an Environmental Youth Corp grant was offered to interested high school students.

A thorough investigation of Red Hill Creek near the Ottawa Street landfill site showed toxic leachate coming out of the area. This was reported to Friends of Red Hill Valley, who reported it to the authorities and the press. The situation is now receiving attention.

Sorger said the programme fulfills an important role in the community. "The university should play a significant role in the life and concerns of the community and this is one way to do it," he said.

"It benefits McMaster, the local community, and most of all, its student participants who learn about science in a socially meaningful way," added Sorger.

Figure 2: Stories published in The Silhouette from October 26, 1995 (top)[90] and November 23, 1995 (bottom).[91] The large pictograms in the middle of the text were likely added to draw the attention of the readers. The pictograms suggest that both features describe a very dangerous situation, but neither describes what the pictograms and headlines suggest.

Another budget cut from the provincial government was announced on November 30, 1995. At $17,000,000, it threatened to raise tuition fees for students while hurting their quality of education.[92] In the same issue, it was revealed that in an effort to reassure students about nuclear reactor safety, McMaster hosted tours of its nuclear reactor for students. The

[90] Clarke, "Reactor's Safety in Question," [photograph].
[91] Staring, "Joint Project Looks into Waste," [photograph].
[92] Scott Staring, "University Takes $17 Million Cut," *Silhouette*, November 30, 1995, 66 edition, McMaster University Archives.

tour included both explanations of the safety mechanisms and descriptions of its uses beyond education. The article also mentioned that support for the reactor had been suffering and it was seeking funding, which was reflected in prior stories in *The Silhouette*.[93]

On February 1, 1996, one of the first positive stories about the MNR in years was printed on the front page of *The Silhouette*. The MNR had received enough funds from a private nuclear research corporation to remain in operation for an extra two months. Decommissioning had seemed imminent for the reactor due to the $800,000 it had been losing each year, which the university saw as less and less worthwhile of an investment. The article stressed that this was the sole reason for the discussion explaining that safety concerns were not a factor. This extension in the reactor's lifetime bought the nuclear physics department more time to search for long-term answers, but the future was still incredibly uncertain.[94]

The long-term solution was announced on June 13, 1996 by McMaster President Peter George. Iodine-125 isotopes produced at the MNR would be sold to private laboratories over the next two years.[95] Though it was never announced in *The Silhouette*, McMaster had recently patented a new method of producing iodine-125 which made this feasible.[96] After the original plan to decommission the reactor was announced, industries who had previously benefited from the MNR came to its aid. The acting reactor director attributed their shift towards focusing on the business side of operations, especially their efforts in marketing to potential customers. The article explained that in addition to the announcement from February 1996, McMaster had delayed the decommissioning a second time which was not

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[93] Brian Buchan, "Nuclear Reactor Tours," *Silhouette*, November 30, 1995, McMaster University Archives.
[94] Michael Michaud, "Reactor Closure Postponed," *Silhouette*, February 1, 1996, 66 edition, McMaster University Archives.
[95] Aaron Vegh, "Mac Reactor Saved by Plan," *Silhouette*, June 28, 1996, 67 edition, McMaster University Archives.
[96] Scott Bradley Hassal, Method and apparatus for production of radioactive iodine (McMaster University, Hamilton, Ontario, issued 1995), https://patents.google.com/patent/CA2172953A1/en.

reported by *The Silhouette* at the time.[97] Thus, despite the several announcements that the MNR would close imminently, it instead narrowly avoided this fate by embracing the industrial production of isotopes. Budget cuts no longer threaten the MNR, which continues to operate nearly 30 years later, but the strategies which saved the reactor are still relevant today.

Discussion

Nuclear physicists at McMaster continue to provide equipment and materials necessary for training and education, and produce important isotopes for medical treatment. Additionally, they have been experimenting with designs for Small Modular Reactors (SMRs). These are nuclear reactors designed to generate electricity by converting nuclear power, similarly to how a typical nuclear power plant functions.[98] They share many of the same benefits as conventional nuclear energy, including low emissions and non-variable power output. However, SMRs are smaller and more compact, as their name suggests. They are also assembled at their intended location from pieces manufactured in different places.[99] Currently, there are many different designs in use developed by universities and private laboratories across the globe, and McMaster is developing their own.[100] The potential applications for SMRs are very promising and have encouraged the wide range of attention they currently receive. One key benefit of SMRs over a standard nuclear power plant is that their versatility and ease of construction makes them ideal for isolated communities and towns. In these locations, having a power generator which requires comparatively little fuel means that they require less frequent shipments of resources, and construction of lengthy

[97] Vegh, "Mac Reactor Saved by Plan."
[98] Canadian Small Modular Reactor (SMR) Roadmap Steering Committee, "A Call to Action: A Canadian Roadmap for Small Modular Reactors," November 2018.
[99] Giorgio Locatelli, Chris Bingham, and Mauro Mancini, "Small Modular Reactors: A Comprehensive Overview of Their Economics and Strategic Aspects," *Progress in Nuclear Energy* 73 (May 1, 2014): 75–85, https://doi.org/10.1016/j.pnucene.2014.01.010.
[100] "Home - Nuclear @ McMaster."

powerlines.[101] This is one of many aspects which makes living in these communities difficult and expensive, so an efficient power generator like a nuclear reactor is appealing. Additionally, building a typical nuclear power plant would require massive amounts of concrete, steel, and other materials, which would need to be shipped in a similarly expensive fashion. Transporting pre-built sections of an SMR would require less trips. Ease of construction is also important since sending a massive number of workers to construct a reactor from scratch would be difficult since many potential locations would struggle to house and feed the workers for the duration of their job. Another important factor with SMRs is that their power output can scale with the needs of the community. Even if the community grows significantly and they require more energy to live comfortably, an SMR could accommodate the growth.[102]

In Canada, many arctic communities are not connected to the rest of the country by the road and are only accessible by airplane. Particularly in Nunavut, these communities currently rely on diesel for electricity. Many other challenges arise when trying to introduce nuclear energy to such remote areas of the country, as many of the residents have little to no understanding of nuclear energy and many important concepts cannot be properly communicated in Indigenous languages.[103] Since most Canadian arctic communities are predominantly populated by Indigenous people, factors like the potential damage to the environment are important when making decisions about energy generation. While SMRs have not yet been implemented in arctic communities in Canada, parallels can be drawn to towns across the globe, particularly in Russia where the technology has been embraced. Forexample, the world's northernmost nuclear power plant is in Pevek, Russia, where a floating power plant

[101] Canadian Small Modular Reactor (SMR) Roadmap Steering Committee, "A Call to Action: A Canadian Roadmap for Small Modular Reactors."
[102] Canadian Small Modular Reactor (SMR) Roadmap Steering Committee.
[103] Canadian Small Modular Reactor (SMR) Roadmap Steering Committee.

called Akademik Lomonosov is docked. Its unique design and versatility demonstrate that SMRs have immense potential to power communities only accessible by boat.[104]

There is little proof that current McMaster students are aware of the research occurring at the MNR, apart from potentially knowing that it produces isotopes for medical treatments. As McMaster develops its SMRs, it should increase outreach, especially on social media, to inform students and members of the wider community of its operations. With so many fears around nuclear research, it would be beneficial for students to understand what happens at the reactor along with its various safety features. As can be seen through McMaster's history, students feel more ease about nuclear research and power when they hear about exciting and positive developments in the field. The MNR has the potential to serve as a very useful gateway for students looking to learn more about nuclear science from a positive and constructive standpoint. Its longevity has convincingly demonstrated its safety and the many hospitals and industries which benefit from its work are testaments to its importance in southern Ontario. McMaster should be uniquely capable of fostering a positive community around nuclear science, especially considering the added credibility from professors who have experience describing their work in a simple fashion.

The described benefits of the MNR throughout its history are useful not only for educating the students at McMaster, but also for use in outreach across Canada. However, the differences between the MNR and proposed SMRs must be addressed for this to be done properly. The most important difference is the simple fact that the MNR does not and has never generated energy. This has essentially shielded the MNR from the distrust which many Canadians felt towards nuclear power, especially in the 1980s. Students at McMaster demonstrated the same wariness of nuclearization that was common among younger Canadians across the country, often without considering what was occurring at their

[104] "Russia's Floating Nuclear Power Plant Passes One Billion kWh," World Nuclear News, January 16, 2025, https://world-nuclear-news.org/articles/russias-floating-nuclear-power-plant-passes-one-billion-kwh.

university. It is likely that many were able to accept that the important work done at McMaster and its extensive safety mechanisms should exempt it from the same criticism. Regardless, articles published for the general student body, like in *The Silhouette*, show that highlighting safety, medical research, and education were paramount for those advocating for the reactor. In the case of the proposed energy generating SMRs, the latter two do not apply. However, the concerns raised by students, particularly in the 1980s when nuclear power was receiving its biggest pushback in Canada, should be considered when performing outreach across Canada.

Conclusion

There are several avenues which future research may take when investigating the MNR and nuclear science across Canada as a whole. Its uniqueness in Canada and persistence against global paranoia has led to stories which could not only be useful for nuclear scientists, but could also be interesting for community members. Additionally, researchers at McMaster have made important advancements in nuclear physics, ranging from Thode's contributions to the Manhattan Project to the research which led to Dr. Bertram Brockhouse's 1994 Nobel Prize. There are papers about current operations at the reactor, but the lack of research into its history is disappointing. Research into this topic is seriously limited by how discomfort around nuclear science was described in surviving primary literature, as the opinions expressed in newspapers may not accurately represent the most widespread concerns. The MNR and nuclear science as a whole were also only mentioned when something notable occurred, making it difficult to evaluate how prevalent any opinions were in general. It is possible to interpret that students simply did not worry about the MNR during periods where it was not discussed, but this cannot be said for certain. Regardless, the overall patterns seen in editorials and news updates in newspapers like *The Silhouette* and *The Hamilton Spectator* reflected broader societal shifts in how nuclear science was

perceived. In the twenty-first century, McMaster students have mostly been apathetic to the MNR despite its continued production and research. It has operated without as much scrutiny in recent decades, matching how many people think about nuclear research today more generally. However, it is difficult to determine whether this is due to the trend of McMaster students reflecting society, or simply because they are unaware of its role in scientific research.

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