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The geoethical legacy of Zonia Baber

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Abstract

The history of science is punctuated by the unacknowledged contributions of women who, despite systemic barriers, fought for both knowledge and justice. Among them, the American teacher of geology and geography Zonia Baber (1862-1956) stands out not only for her advancements in geoscience education but, in parallel, for her relentless activism in defence of human rights, environmental preservation, and social equity. A fierce opponent of imperialism, racial oppression, and gender discrimination, she used her academic expertise as a platform for advocacy, recognising the inextricable link between geosciences and ethical responsibility. She worked within international networks to expose social injustices and the exploitation of both people and natural resources, promoting a vision of geosciences that served not only intellectual progress but also humanitarian and environmental causes. Simultaneously, her environmental engagement foreshadowed a modern geoconservation ethos, emphasising the need to safeguard geological heritage as both a scientific and cultural asset. This article contributes to a wider doctoral research project on public geological communication, which includes the recovery of overlooked histories of pioneering women in geosciences to help inspire girls to pursue scientific education. Framed within this broader context, Baber's legacy is re-examined here through the lens of geoethics, demonstrating how her vision, rooted in the convergence of science, activism, and justice, offers a significant perspective for contemporary debates on the ethical role of the geosciences in shaping a more equitable and sustainable world.

Keywords: Geoethics, Geoscience and activism, Women in geosciences, Historical gender bias, History of geosciences.

1. Introduction and historical context

Women's engagement in geosciences has always been closely tied to the wider struggle for educational access, professional recognition, and intellectual authority. For centuries, their exclusion from scientific life was not a mere oversight, but a deliberate system, upheld by social conventions, political hierarchies, and economic structures that reinforced male dominance. Across the world, academic institutions remained almost entirely male domains well into the modern era. In the United States, for instance, women were not formally admitted to higher education until 1837, when a small number of institutions began to enrol female students. Yet many of these so-called 'colleges' were modest teacher training schools or religious seminaries. Their creation came more than two centuries after the founding of the earliest universities, established exclusively for the advanced education of young men. It was only in the latter half of the 19th century that the landscape began to shift, as women's colleges emerged and more universities embraced coeducation, often as a pragmatic response to financial strain rather than a genuine commitment to gender equality (Antler, 1982). Even then, women's inclusion was conditional and unequal: they were often required to undertake domestic work in exchange for tuition, a stark reminder that their intellectual aspirations were still considered secondary to their service. By 1900, women made up nearly 30% of students in American higher education, yet their opportunities remained confined to traditionally 'acceptable' professions – above all, teaching. Although intellectually demanding, teaching was presented as a natural extension of women's presumed maternal disposition, rather than as a legitimate expression of academic ambition. Moreover, female teachers were paid far less than their male counterparts, reinforcing the perception of their labour as supplementary. As women's academic achievements gained visibility, anxieties over an apparent 'feminisation' of universities and a threat to male intellectual authority prompted new institutional barriers. While enrolment increased, women remained excluded from most research environments, their contributions either ignored or credited to male peers. The very structure of scientific validation, such as journals and professional societies, was designed to marginalise female scholars, reinforcing the belief that intellectual prestige belonged to men.

This deeply ingrained bias was especially pronounced in the geosciences. Geology, with its close ties to resource extraction and mining, was firmly aligned with industrial expansion and exploitation, reinforcing economic hierarchies and privileging the wealthiest social classes. It was dominated by men who controlled access to both fieldwork and institutional power. Women were largely excluded from the physical demands of geological exploration, as they were deemed too delicate for the rigours of field investigations, while those who pursued careers in academia found

themselves confined to teaching roles, their contributions dismissed as pedagogical rather than scientific. Geography, particularly in educational settings, offered one of the few avenues through which women could engage in scientific discourse. However, the barriers they faced remained substantial. Even as women earned degrees in increasing numbers, the perception of their intellectual inferiority persisted, with critics warning that advanced study would weaken their health, threaten their reproductive capacities, or divert them from their 'natural' roles (Antler, 1982). At the same time, educational privilege was shaped not only by gender but also by class.

Figure 1. *Zonia Baber, associate professor, and head of the Geography and Geology department, University of Chicago, 1902 (University of Chicago Photographic Archive, [apf1-00300], Hanna Holborn Gray Special Collections Research Center, University of Chicago Library).*

Deep-rooted social divisions meant that children from impoverished backgrounds were often denied access to schooling, as economic hardship forced many into work from an early age.

These inequalities played out against a backdrop of global unrest, as the late 19th and early 20th centuries were marked by war, imperial conquest, and chronic racial violence. In the United States, the abolition of slavery in 1863 and the end of the Civil War in 1865 failed to deliver genuine emancipation. Racial segregation, the structured deprivation of rights, and systemic oppression continued to shape the lives of ethnic minorities, enforced through institutional barriers and racial terror. Beyond the American context, imperial powers expanded their dominance over resource-rich, but politically and economically vulnerable regions, driven by industrial ambitions and justified through pseudoscientific ideologies – many of which were embedded within educational systems, including the geosciences. As European colonial empires reached their height, American imperialism intensified, both sustained by racial hierarchies that cloaked exploitation in the language of scientific legitimacy and progress.

Within this frame, the teaching of geosciences became a vehicle for ideological control, subordinated to the priorities of imperial expansion and industrial capitalism. Scientific curricula were infused with colonial and racial narratives that lent intellectual legitimacy to exploitation and conquest. The consequence was that, rather than fostering critical inquiry, geoscience education too often served to naturalise systems of dominance, masking power relations behind the authority of science itself. It was within this compromised landscape that Zonia Baber (Figure 1) would begin to challenge prevailing orthodoxies, reimagining the role of geography and geology in education as tools for empowerment rather than oppression.

2. Zonia Baber's life and educational path

Although this section touches upon the essential aspects of Zonia Baber's life and educational vision, including her early experiments in holistic and experiential geoscience teaching, a more detailed examination of her pedagogical contributions is offered in Rosati et al. (2025a). That publication and earlier conference presentations (Rosati et al., 2024; 2025b) were focused on her progressive didactic model and classroom innovations, providing a dedicated analysis of her role as an educational pioneer. The present article, by contrast, integrates these elements in a context-setting capacity, as part of a broader geoethical reflection on Baber's multifaceted legacy.

Born on 24 August 1862 in Kansas, Illinois, Zonia Baber (originally Mary Arizona Baber) grew up in a rural environment that nurtured her early fascination with the natural

world. Her formative years were shaped by direct engagement with the landscapes surrounding her family's farm (Schultz and Hast, 2001), sparking a passion for geology and geography that would define her career. Determined to pursue an education despite the constraints imposed on women at the time, she completed high school in Paris, Illinois. Her career as an educator began in the 1880s. After graduating in 1885 from the Cook County Normal School in Englewood, Illinois, she briefly worked as a school principal in Ohio, then returned as an instructor. In 1889, she was appointed head of the Department of Geography, a post she would hold for the next ten years. During this period, she began to redefine the teaching of geosciences, introducing innovative methods such as tactile models, laboratory experiments, and field excursions. It is worth recalling that the normal schools of the time, being institutions dedicated to the training of teachers, fulfilled a broader and often underestimated function within the American education system. Although they were not recognised as universities, they frequently acted as their surrogates, especially for students who were excluded from higher education because of financial constraints or restrictive social conditions. Among these were many women. But nonetheless, at a time when access to higher education for women was expanding more in principle than in practice, Baber succeeded in navigating institutional barriers that, though beginning to loosen, still mirrored deeply rooted gender hierarchies, particularly within the male-dominated scientific faculties of newly coeducational universities. Amid these shifting conditions, in 1895, as American universities gradually began admitting women into scientific disciplines, Baber was among the first to enrol at the University of Chicago in the same year, joining the first geology course ever offered to female students. In 1896, in the meantime, she patented a specialised desk for geoscience education, responding to the ergonomic and practical shortcomings of existing school furniture. This invention allowed students to store their materials efficiently while maintaining proper posture: an emblematic example of her holistic approach to teaching, where even the learning environment was carefully considered (Baber, 1896). Notably, the desk incorporated a shallow, removable tray fitted into a recessed compartment within the desktop, conceived as an integral part of the structure rather than an accessory. Designed to accommodate materials such as sand or clay, it enabled students to alternate between written and tactile tasks without disrupting the flow of learning. The desk also featured specific compartments for storing water, ink, and other instruments, thereby ensuring that all necessary tools for both scientific modelling and conventional writing were immediately accessible. By embedding such functionality into the very architecture of the school desk, she anticipated later educational philosophies that prioritised hands-on learning and spatial adaptability within the classroom.

When the Cook County Normal School became the Chicago Normal School under city management, she continued teaching there until 1899, when she moved to the newly established Chicago Institute of Pedagogy. Two years later, at the request of University of Chicago president William Rainey Harper, the Institute was merged with John Dewey's Laboratory School to form the University of Chicago's School of Education (Schultz and Hast, 2001), where Baber was appointed Associate Professor of Geography and Geology. In 1902, she briefly served as principal of the School of Education before earning her Bachelor of Science degree in 1904. She remained at the University of Chicago for nearly two decades, leading the Department

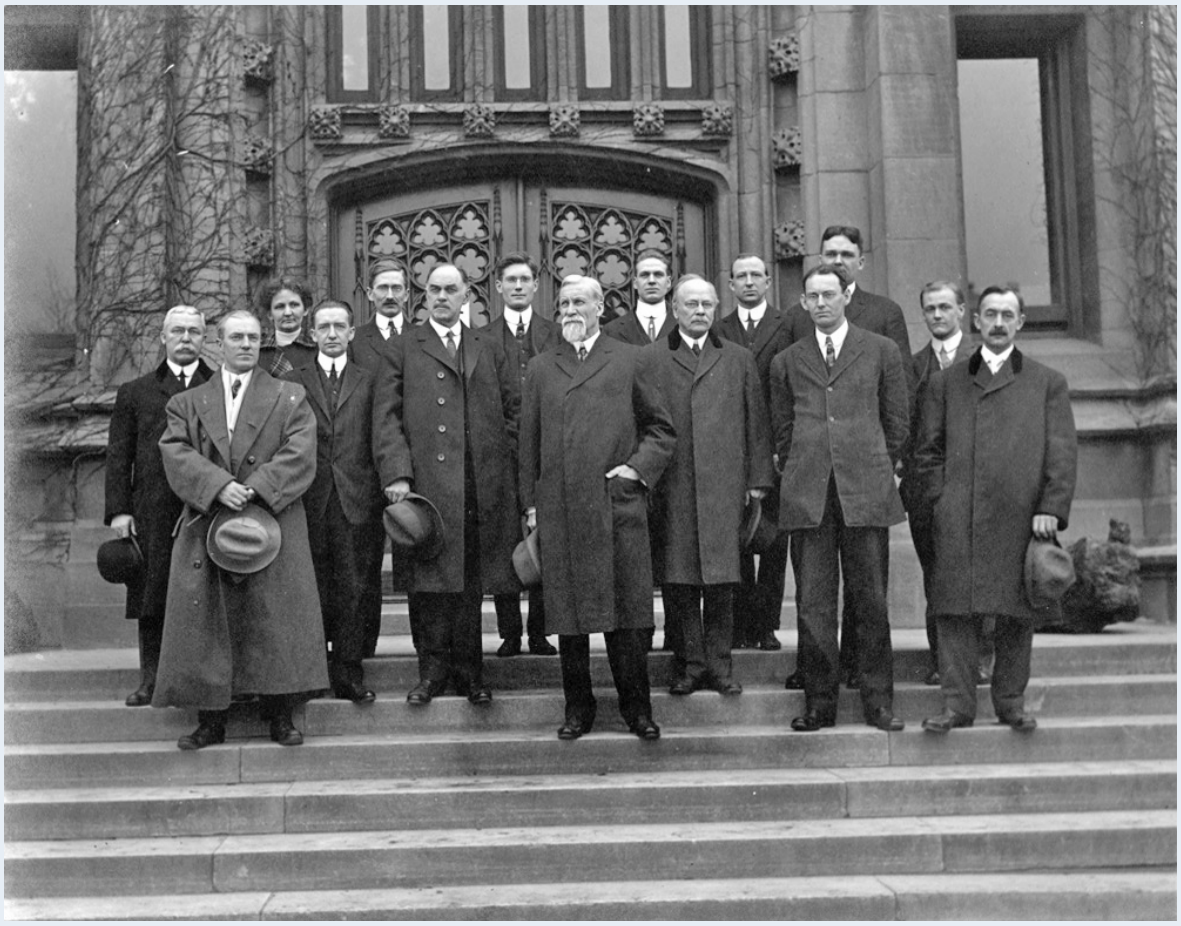

Figure 2. *Faculty of the Geology, Geography and Paleontology departments at the University of Chicago, 1912/1913 (University of Chicago Photographic Archive, [apf1-05465], Hanna Holborn Gray Special Collections Research Center, University of Chicago Library). The lone woman at the top left is Zonia Baber.*

of Geography and Geology, and cementing her reputation as a transformative figure in geoscience education (Bailey, 1994; Ogilvie and Harvey, 2000). At the time, she appears to have been the only woman entrusted with such a leadership role within the University's scientific departments. Archival evidence, including a formal group photograph (Figure 2), shows her as the sole female among her male peers. She rapidly gained recognition for her innovative teaching methods, which challenged the prevailing norms of geography and geology education. Rejecting rote memorisation and static textbook learning, Baber embraced a pedagogy centred on observation, inquiry, and direct interaction with natural phenomena. At the heart of her approach was the conviction that students understand Earth processes most effectively through experience. To this end, she introduced a multi-sensory and experiential methodology that integrated field excursions, laboratory simulations, and tactile modelling. Her students constructed three-dimensional models of geological features, such as mountain chains, dunes, and rivers (Baber, 1901a), enabling them to grasp complex processes like erosion, sedimentation, and tectonics in a tangible and intuitive manner. These hands-on activities were often complemented by classroom experiments replicating phenomena such as rainfall or streamflow, fostering practical understanding of geological dynamics and sharpening both logical reasoning and observational acuity (Baber, 1901b). Fieldwork, central to her pedagogy, was meticulously planned to expose students to geologically significant landscapes across the United States, allowing them to observe and interpret the dynamics of Earth systems first-hand. She considered these excursions essential not only for consolidating scientific knowledge but also for fostering intellectual independence and a holistic awareness of the human-environment relationship (Baber, 1901c). Beyond the scientific dimension, Baber's teaching was also remarkably inclusive and socially conscious. She promoted international correspondence among students to stimulate intercultural exchange and broaden their understanding beyond national and disciplinary boundaries (Baber, 1901d; Baber, 1901e). She urged the integration of contemporary geopolitical and environmental issues into geoscience curricula, encouraging students to engage critically with the world around them (Baber, 1901f). In addition, she pioneered the use of creative pedagogical strategies, such as dramatic reenactments (Baber, 1901a) and collaborative mapping projects (Baber, 1904), that made geoscience education more immersive and accessible. In all these respects, her methodology anticipated educational philosophies that would only gain prominence decades later, positioning her as a truly visionary figure in the history of geoscience pedagogy.

She continued her academic tenure until 1921, when a severe physical disability resulting from an automobile accident forced her to step down from formal teaching (Pittser, 1999). However, her intellectual involvement did not end with retirement.

She remained an active voice in scientific circles and public debate, using her professional and popular standing not only to promote her alternative approach to geoscience education, but also to advance the causes that had long defined her public engagement. Throughout her long and active life, she travelled extensively, even during and after her teaching years. In 1914, for instance, she was stranded in the Fiji Islands at the outbreak of the First World War. Her journeys around the world were purposeful expeditions, bringing vivid first-hand insights from distant lands into her classrooms while also sustaining her social commitments. Wherever she went, her travels deepened her sensitivity to people and places alike, a sympathy she carried forward into her academic work and advocacy. Her vision of geoscience education was radically inclusive and deeply attuned to social realities, equipping students not merely to understand the Earth, but to act conscientiously within it. Because of this, she stands out as one of the few women geoscientists of her era to be featured in multiple editions of *American Men of Science* (Bailey, 1994; Ogilvie and Harvey, 2000), a publication that, owing to the stubbornness of trailblazing women like her, now bears the more inclusive title *American Men and Women of Science*. Through her writings, lectures, and activism, Baber supported a broad spectrum of humanitarian and environmental struggles, from universal suffrage and women's emancipation to demilitarisation, decolonisation, and the ethical stewardship of the natural world. These aspects will be discussed further in the next sections of this article. She passed away in East Lansing, Michigan, on 10 January 1956, at the age of ninety-three.

3. The struggle for human rights and gender equality

Alongside her pedagogical innovations, Zonia Baber played a significant role in early twentieth-century social movements for pacifism, feminism, anti-racism, and global justice. Her vision of education as a civic and ethical duty was mirrored in a broad spectrum of public interventions, ranging from anti-war protest to the defence of civil rights and international solidarity, which reveal the full extent of her intellectual engagement.

In 1898, she founded the Geographic Society of Chicago, envisioning it as an inclusive, open meeting ground where professional geoscientists and curious laypeople could come together to deepen public understanding of the world. She first served as vice-president and then as president, guiding the Society's mission through lectures, student-led illustrations, and excursions. Her lifelong service and her recognition at the Society's fiftieth anniversary in 1948, when she was honoured with a gold medal, affirm her unwavering dedication. The esteem she enjoyed reflected

her exceptional ability and contagious passion for making geographical and indeed geological knowledge accessible to a wider audience (Schultz and Hast, 2001).
Within the Society, her work promoted peace and solidarity through geographical and geological knowledge, gave voice to women geoscientists, and laid the groundwork for geoconservation – a topic explored in more detail in the next paragraph. Baber's social militancy also extended to the feminist movement. Active in the Illinois Equal Suffrage Association since 1914, she supported campaigns for women's political emancipation and civic reform. Notably, she also advocated for the extension of suffrage to women of colour and immigrant communities, challenging the racialised exclusions that characterised parts of the mainstream suffrage movement. She later joined the National Woman's Party in this respect.
A deep commitment to anti-racism permeated both her civic and educational work. As early as 1916, in her article *Lost Opportunities in Teaching Geography* (1916), she condemned the use of geography to reinforce racial stereotypes and called instead for an internationalist pedagogy that challenged prejudice.
Her enduring friendship with Jamaican-American journalist and historian J. A. Rogers epitomised her solid humanistic ethos. In 1917, upon learning that Rogers had been denied admission to the University of Chicago despite his intellectual distinction (Alexander and Rucker, 2010), Baber not only included his self-published books as required readings in her courses, but also actively promoted them, purchasing multiple copies to share with influential colleagues nationwide (Rogers, 1919). She even invited him to represent the African perspective in a 'miniature' Universal Races Congress she organised for her students, and regularly welcomed Black, Asian, and Indigenous speakers to her classes, thus embodying her pioneering commitment to a truly inclusive, decolonial education decades ahead of its time. Rogers, in turn, celebrated her as «*animated in the highest degree with that spirit of democracy, that catholicity of taste and thought whose increasing influence is today inspiring the world to sublimer, nobler ideals*» remarking that «*The Negro, or rather Justice, has friends and stanch friends in many a place one little thinks, and Miss Baber is certainly one of them*» (Rogers, 1919). As president of the Race Relations Committee of the Chicago Women's Club, and executive member of the local National Association for the Advancement of Colored People (NAACP), she also promoted intercultural dialogue and public visibility for African-American artists and intellectuals. In 1927, she organised *The Negro in Art Week* at the Art Institute of Chicago, one of the first exhibitions in the United States dedicated to African and African-American art (Schultz and Hast, 2001).
A revealing episode of her uncompromising pacifism unfolded in December 1917 during a meeting of the Woman's Bar Association of Chicago. There, she delivered a speech that sparked immediate controversy (The Chicago Daily Tribune, 1917,

December 7, p. 14). Amid the fervent patriotism and tension of the First World War, her clear yet unorthodox intervention challenged the dominant sentiment so directly that it was perceived as provocative, even antagonistic, by many of the very women she had long supported. Baber forcefully attributed the responsibility for war to what she called man's 'savage instinct', expressed both on the battlefield and in the ritualised violence of sport. Critiquing the archaic ideal of male superiority rooted in physical strength, she declared: «*If a man cannot control his savage instincts, he should be assisted*» – while brandishing a table knife for rhetorical effect. Her radical proposal that missionaries, rather than soldiers, should have been sent to Germany was swiftly opposed. Several women in attendance, steeped in wartime patriotism, rejected the notion that violence could be countered by education or spirituality, insisting instead on the necessity of military force. Others questioned the premise of a moral divide between male savagery and female compassion, pointing to women's enthusiastic participation in violent sports and even acts of domestic aggression. This exchange underscores how her pacifist beliefs conflicted not only with prevailing public discourse but even with women involved in the same pursuit of equality. Her critique of patriarchal violence proved difficult to grasp in a society permeated by wartime rhetoric that embraced feminine sacrifice as a form of national service and reasserted the figure of the soldier as a noble ideal. As evidenced, Baber's ethically consistent and intellectually forward-thinking positions were frequently misunderstood or marginalised, even within feminist circles. Her reflections anticipated deeper critiques of militarism and gender, yet her voice remained out of sync with a cultural climate still anchored in patriotic and patriarchal paradigms. In this sense, her clarity of vision was often met with scepticism and resistance.

Her pacifist commitment took institutional form through the Women's International League for Peace and Freedom (WILPF). A member of its Executive and Education Committees, Baber was also present at the 1921 Geneva Congress, where she advocated for the revision of school textbooks to remove content that fostered animosity between nations and instead promote empathy and intercultural understanding. In 1923, she delivered a keynote address at the WILPF Congress in Pacific Grove, California, entitled *The Requirements of Permanent Peace*, arguing that physical disarmament was merely a first step: genuine peace, she insisted, depended on cultural and ethical transformation. This vision culminated in the 1948 publication of *Peace Symbols*, a volume documenting forty monuments to peace around the world and dedicated to the WILPF as a gesture of intergenerational solidarity.

In 1926, Baber travelled to Puerto Rico, where, supported by the National Woman's Party and the Society of Woman Geographers, she campaigned to secure voting rights for Puerto Rican women. She acted as the representative of the Pan-American Committee

of the WILPF (Schultz and Hast, 2001). To raise public awareness of the suffrage movement on the island, she was photographed alongside another trailblazer of the era, Burnita Shelton Matthews – a fervent human rights activist and the first woman to serve as a judge in the United States federal courts – for the cover of *Equal Rights* on 3 July 1926 (Figure 3). Puerto Rico, ceded by Spain to the United

Figure 3. *Miss Zonia Baber (left), representative of the women of Puerto Rico in the United States, consulting with Mrs. Burnita Shelton Matthews (right), Legal Research Secretary of the National Woman's Party, on the drafting of a bill for introduction in Congress extending suffrage to the women of Puerto Rico, 1926 (Library of Congress, https://www.loc.gov/item/mnwp000080/, accessed 11 September 2025).*

States in 1898, granted US citizenship to its residents in 1917, yet women did not obtain the right to vote until 1929. The island's political status remains complex and unresolved, as it endures as an unincorporated territory of the United States, with ongoing debates surrounding the prospect of it becoming the nation's 51st state.
In 1926, still under the auspices of the WILPF and together with its members, she joined a special investigative mission to Haiti led by her close colleague Emily Greene Balch, who would later receive the Nobel Peace Prize in 1946 for her dedication to international peace and disarmament. This mission was tasked with assessing the consequences of the United States' military occupation of Haiti, which had begun in 1915 under the guise of restoring stability but had instead entrenched severe social and economic exploitation. Her analysis demonstrated a profound understanding of education as a tool of both liberation and oppression. It follows that she critically examined the systematic loss of Haitian educational structures (Baber and Balch, 1927): she denounced the replacement of locally rooted pedagogies with rigid, externally imposed curricula designed to consolidate American control and diminish Haitian cultural identity. She also highlighted how U.S. authorities undermined Haitian teachers, neglected rural schools, and imposed an educational model that alienated children from their own history and language. In her report, she called explicitly for the restoration of Haitian educational autonomy as a crucial precondition for genuine sovereignty and social reconstruction. Moreover, Baber joined her fellow delegates in submitting a forceful appeal to the U.S. Congress, condemning the occupation as a form of 'military slavery' and demanding the immediate withdrawal of American troops. This bold intervention placed her among a rare group of white American women willing to confront the imperial ambitions of their own nation and to advocate publicly for Black sovereignty in the Caribbean. The U.S. occupation ultimately lasted until 1934. Haiti continues to face profound political instability and severe humanitarian crises today, struggling with chronic poverty, the collapse of state institutions, and escalating violence by armed gangs.
As she grew older, Baber expanded her dedication to human rights onto the global scale: from her critical observations of colonial injustices in Africa and India, to her promotion of interfaith cooperation as a defence against nationalism and racial hatred, she supported mutual respect and understanding across differences. Even at 84, when appointed to the Chicago Advisory Committee on assistance to Japan after the Second World War, she continued to advocate for women's leadership in postwar reconstruction: a testament to her firm conviction that education and international solidarity were the truest paths to lasting peace.

4. The early calls for environmental ethics and geoconservation

At a time when geoheritage preservation was neither theorised nor recognised as a scientific concern, Zonia Baber was among the first to argue for the stewardship of geologically significant landscapes, not only as records of Earth's past but as fundamental to humanity's sense of belonging and responsibility towards the planet. She became actively involved in campaigns to maintain their integrity, working alongside other activists in the emerging conservation movement who understood that protecting these landscapes also meant safeguarding opportunities for future scientific research and public geological literacy. Some of the clearest expressions of this ethic are exemplified in three notable episodes that unfolded in the early decades of the twentieth century: moments that underscore how her environmental engagement took shape in specific, geologically meaningful places within and around the city of Chicago (Frank and Jerome, 1916). These included the sandstone gorges of Starved Rock, the Silurian limestone of Stony Island (dating back more than 400 million years), and the wind-sculpted dunes of the Indiana Dunes' beaches, all of which are located either within the urban boundaries or just beyond them, in the wider Midwestern region. These are sites she had visited on numerous occasions, both during her field research and as immersive outdoor classrooms for her students. Her profound connection to these landscapes stemmed from a dual commitment: as a geoscientist attuned to their exceptional geological significance, and as an educator determined to transmit that understanding. For her, these were not just scenic or recreational places, but spaces of scientific inquiry and educational potential: living laboratories where the geological past could be observed, interpreted, and shared. She recognised in them not only the richness of their physical features but also their enduring civic and pedagogical value, which called for long-term stewardship and collective engagement.

The first of these three conservation episodes took shape in 1909, as Baber, through the Geographic Society of Chicago, spearheaded efforts to preserve the Starved Rock region in LaSalle County, Illinois. This area, located along the southern bank of the Illinois River, is distinguished by its imposing sandstone cliffs, deep canyons, and waterfalls, shaped over millennia by glacial activity and the rushing Kankakee Torrent approximately 19,000 years ago. Baber and the Society advocated for its protection, culminating in the Illinois Legislature's 1911 act to establish Starved Rock as a state park. Nowadays it stands as the most visited park in Illinois, renowned for its exquisitely scenic geological features.

Following her active involvement in the creation of the Starved Rock State Park, she turned her attention to the limestone ridge of Chicago known as Stony Island,

a distinctive hill that once rose in marked contrast above the flat, swampy landscape of the southern shore of Lake Michigan – a contrast now largely obscured by urban development. Stony Island is a Silurian-aged reef formation that resisted glacial erosion during the last ice advance, resulting in a prominent topographic relief. Once an island within glacial Lake Nipissing, its wooded summit and rocky outcrops earned it its evocative name. Its exposed reef limestones, glacial striations, and biologically rich microhabitats made it a site of considerable scientific value. By the 1910s, however, the eastern flank of the hill had been significantly altered by urban expansion. Baber sought to secure legal protection for what remained of this natural feature. In 1912 she initiated a bold public campaign under the banner 'Save Stony Island'. She authored a pamphlet titled *Stony Island: A Plea for its Conservation* (1917), advocating for the preservation of at least the western portion of the hill, including an abandoned quarry and the surrounding 15 acres. Her proposal aimed to establish the area as a state park for scientific study and public benefit. She organised special excursions to the site, mobilised her network of educators and scientists, and wrote numerous appeals to the South Park Commissioners. The campaign continued for several years and attracted moderate public interest, especially in 1917, when her supportive articles appeared in the local press. Despite these efforts, however, no action was taken by the authorities. The bill presented to the Illinois State Legislature was ultimately rejected, and the strength of the movement began to wane over the course of the 1920s. Although Baber's proposal was never realised, her activism remains a significant chapter in the early history of urban geoconservation. Currently, much of Stony Island is obscured by residential development, and the geological outcrops that once defined the hill have largely been destroyed. Yet traces of its original topography remain visible in the Calumet Heights neighbourhood.

Another of her last efforts emerged as a growing coalition of scientists, educators, and civic activists began to voice concern over the escalating industrial threats to the Indiana Dunes, along the southern shore of Lake Michigan. Shaped over millions of years by glacial retreat and subsequent erosional and depositional processes, the region presents an exceptional stratigraphic record and geomorphological variety, offering insights into past climatic oscillations and sedimentary processes. The towering dunes, interspersed with blowouts, swales, and interdunal wetlands, form a dynamic system of great scientific interest. Even Baber joined the advocacy efforts aimed at safeguarding the area from encroaching urban and industrial development. On 30 October 1916, during a hearing organised by the United States Department of the Interior in Chicago to assess the feasibility of establishing a Sand Dunes National Park, she was among the 42 speakers invited to present their arguments. Her intervention, preserved in Stephen Mather's 1917 report to the

Secretary of the Interior, was distinguished by its incisive ethical reasoning and its forward-thinking educational perspective. She portrayed the dunes as a living classroom, an irreplaceable resource for cultivating geological awareness and ecological responsibility. Through her sharp and resonant statement: «*I can truthfully say that I should like to believe in the old orthodox Hades for the people who will not save the dunes now for the people who are to come*», she articulated the moral gravity of environmental inaction. Her speech (Mather, 1917) reveals the ethical urgency that underpinned her environmental engagement. As one of the founding members of the National Dunes Park Association (NDPA), she also contributed to galvanising a wider popular support and building the institutional frameworks necessary to transform activism into policy. While the full realisation of a national park remained elusive during her lifetime, these collective efforts bore fruit in 1925 with the inauguration of the Indiana Dunes State Park, securing a significant, though partial, measure of protection. It was not until 1966, over a decade after Baber's death, that the United States Congress established the Indiana Dunes National Lakeshore, later re-designated in 2019 as the Indiana Dunes National Park. Today, this protected area extends over 15,000 acres and remains a vital natural archive, preserving a landscape created by the interaction of geological processes and serving as a hub for scientific research and educational outreach.

5. Conclusions

The history of geosciences has long centred on celebrated male pioneers, often neglecting the transformative contributions of women who dared to challenge exclusionary structures. Among them, Zonia Baber (1862-1956), rather than accepting their marginalised voices as inevitable, exposed these barriers as deliberate constructs demanding dismantlement. Yet her legacy must also be approached with nuance. Her accomplishments were facilitated, at least in part, by the structural advantages of her social position: being a white, middle-class woman in the United States, she could access institutional networks and public platforms that remained largely closed to many women, above all those of colour, Indigenous women, and those from working-class backgrounds. That context, however, makes the choices she made even more significant. What makes her contribution remarkable is that she chose to use that position to amplify excluded voices – whether by advocating suffrage for women or amplifying critical perspectives on imperial policy. Her stance, therefore, simultaneously reveals the asymmetries of women's access to scientific and political authority that defined her era and underscores the distinctiveness of her inclusive commitments. Likewise, her pedagogical innovations prompt a reconsideration

of the epistemological foundations of the geosciences themselves. By intertwining scientific research with a profound commitment to social justice and cultural and environmental awareness, she challenged dominant positivist paradigms that cast knowledge as disinterested and purely factual. She advanced a participatory, inclusive model that empowered students to understand geological processes, recognising the social and ethical dimensions of the discipline. Her educational vision was acutely tangled with her broader commitments: she stood at the intersection of gender equality, anti-colonial resistance, pacifism, anti-racism, and environmental stewardship, embodying a form of intellectual activism that transcended disciplinary and national boundaries. Her solid defence of marginalised voices – from her support for Haitian and Puerto Rican sovereignty to her solidarity with African-American and other world-wide intellectuals – illustrates how geoscientific knowledge can be mobilised as a tool for planetary justice. In doing so, she foreshadowed a vision of geosciences as ethically accountable and committed to the collective good, a framework in strong resonance with the geoethical challenges of our time. Even her environmental interventions, particularly her early calls for the conservation of geologically significant sites, further anticipated contemporary geoethical debates on the relationship between natural heritage, shared memory, and social responsibility. However, her conservation campaigns also faced limitations. Their mixed outcomes (i.e., the eventual protection of Starved Rock and the Indiana Dunes versus the failure to secure Stony Island) indeed testify to the slow uptake of geoethical perspectives within culture, policy, and practice of her time. In parallel, this long and uneven reception of her ideas also reminds us that geoethics has struggled to gain recognition within scientific institutions. Even the afterlife of her agenda has been fragmented. A telling example lies in considering Baber in relation to contemporary frameworks, which further clarifies both her foresight and the work still to be done. While her name survives in educator networks and in public-history and digital projects (e.g., *Women in Peace*, *Suffragette City 100*, *Peace Monuments Around the World*, and related commemorative initiatives), there is limited evidence that her programme was systematically sustained within the discipline or by other institutional bodies. As previously discussed, the way geosciences are taught today owes much to her innovations, though her pioneering role remains largely overlooked. Furthermore, UNESCO's geoheritage initiatives and the International Geoscience and Geoparks Programme, together with IUGS projects, for instance, now formalise links between geological heritage, community value and sustainable development. Likewise, the emerging movement to decolonise geosciences presses for plural knowledges, more reflexive curricula and more equitable practice. Even though it is unrealistic to expect such frameworks to acknowledge her as a direct intellectual precursor, all these contemporary lines of thought echo core elements of Baber's ideas, reflecting

concerns that she articulated a century earlier. The figure of Zonia Baber invites us to rethink the place of geoscientists within society and the ethical responsibilities at the core of scientific inquiry. Her life demonstrates how geosciences and social justice can, and perhaps should, converge. Revisiting her legacy today offers valuable insights into the transformative potential of geosciences when grounded in a commitment to human dignity and ecological integrity. In an age marked by accelerating environmental crises and intensifying social inequities, Baber's life exemplifies a radical and still relevant proposition: that geoscience education and research must serve as vehicles for fairness, cultivating intellectual rigour alongside a strong ethical consciousness. Her example underscores the urgent need for a geoethics that is not purely theoretical, but actively engaged in fostering more equitable and sustainable societies. In this light, Zonia Baber emerges as a prescient guide for re-envisioning the ethical horizons of geosciences today.

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