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Chip on Her Shoulder: Queering the CHIPS and Science Act of 2022

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ABSTRACT
The signing of the bipartisan statute Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act of 2022 shines a spotlight on the current role of semiconductors in shaping economics, geopolitics, and education in the United States. Underlying techo-capitalistic, extractionist, and settler-colonial logics reveal a motive that supersedes promises of diversity, equity, and inclusion (DEI) initiatives to uplift marginalized groups. Despite this, critical feminist frameworks can offer valuable insight into both problematizing and queering the CHIPS Act in a way that affirms the personhood of individuals and communities. By reevaluating the foundational values of this act, we can begin to outline challenges and possible action to facilitate just and sustainable participation in the progression of semiconductor technologies. This essay is written as part of a collection of student works from the course "Humanities-Informed STEM" in the Samueli School of Engineering and Applied Sciences at the University of California, Los Angeles for Queered Science & Technology Center: Volume 2 [1].

1. WHAT IS THE CHIPS ACT?

The CHIPS and Science Act of 2022 is a bipartisan statute that appropriates funds for various agencies and programs with the purpose of bolstering the semiconductor industry and related sciences in the United States. Division A of the act, titled CHIPS Act of 2022, appropriates $52.7 billion in total for semiconductor manufacturing, research and development (R&D), workforce training and education, and international cooperation [2].

$39.0 billion of this budget is put towards providing financial incentives and subsidies for building, expanding, and equipping domestic fabrication facilities (fabs) and supply chain companies in order to discourage overseas outsourcing [2]. The act also provides 25% investment tax credits for costs related to manufacturing equipment, encouraging public and private investment in semiconductor production [2].

The act has also allocated money towards funding various programs within government agencies, including the Department of Commerce, National Science Foundation (NSF), and Department of Defense (DoD). Within the Department of Commerce, the Economic Development Administration (EDA) has created the Regional Technology and Innovation Hubs (Tech Hubs) using $500 million to launch and $10 billion over the next 5 years [3]. It aims to invest in regions that the semiconductor industry is not prevalent in, especially in rural areas and places not on the coast, by designating Tech Hubs "based on selection factors which include likelihood of success and [...] the extent to which the regional technology and innovation hub significantly engages and benefits underserved communities in and near metropolitan areas" [4]. Through Tech Hubs, the EDA aspires to create a strong pipeline from educational institutions to the semiconductor industry, spread out as evenly as possible across the United States. The act also authorizes a number of scholarships, awards, and grants to be organized by the NSF and given to people studying in institutions of higher education, teachers with notable success teaching K-12 STEM curriculums, and research groups focusing on a number of engineering-related topics [4].

Furthermore, the push for growing the semiconductor industry exclusively within the United States is deeply intertwined with the matter of national security. The act was signed in order to compete with China and other "countries of concern" [2]. Congress has highlighted the United States defense system's reliance on state-of-the-art technology (including semiconductors) and innovative research. For the United States government, "in the event of a

trade dispute, military conflict, or other potential disruption, in addition to concerns about product tampering and intellectual property theft," dependence on East Asian facilities becomes a political weakness [2].
Throughout the statute, many lines add DEI measures. For example, the Department of Commerce should include economically disadvantaged groups and minority, veteran, and women-owned businesses by analyzing semiconductor industry data, how many grants and awards are rewarded and received, and aggregated workforce data by race or ethnicity, sex, and job categories [4]. Within the school to industry pipeline, the Office of Science of the Department of Energy (DOE) and National Institute of Standards and Technology (NIST) are tasked with increasing participation from "historically Black Colleges or Universities, Hispanic-serving institutions, Tribal Colleges or Universities, minority-serving institutions (MSIs), [and] community colleges" through broadening the recruitment pool and providing grants to start various STEM programs [4]. The NSF "may" increase diversity in the recipients of monetary awards by expanding outreach to the groups stated above, institutions of higher education that are near to or serve rural communities, [...] labor organizations, [and] higher education programs that serve or support veterans" [4]. Commendable to a certain extent, these general statements nevertheless gloss over and do little to combat the technological inequities in our society. Instead of evanescent statements of inclusion, we begin the process of problematizing and queering the CHIPS and Science Act by centering critical black and native feminist frameworks in order to understand what logics the CHIPS Act operates within and their effect.

2. MANUFACTURING SEMICONDUCTOR PROPERTY AND CORPORATE PERSONHOOD

The reasons for and results of technoscientific development are invariably puppeteered by capitalistic strings. In the CHIPS Act, these strings are the explicit funding numbers allocated for corporations and research centers with the intention of molding the semiconductor industry into a source of economic and political power. Proponents of the CHIPS Act argue that this funding will bring more jobs and increase equity across engineering work and education to help individual people and communities. However, it is this exact economic reasoning that perpetuates the patriarchal triad of sovereignty, property, and personhood which has systematically marginalized those same groups and purposefully created these inequities over the United States' history.

In *Vexy Thing*, author Imani Perry defines the framework of patriarchy as an active exercise in which a sovereign power delineates personhood through the seizure and redistribution of property under the law. Groups in power constructed the "juridical foundation that would establish modern patriarchy" and the logics that justified the violent undertakings of colonialism and slavery [5]. Personhood - as in who had rights and power, who had ownership of property, and, most importantly, who did not - was legally defined and philosophically "proven" through statements of difference in human nature [5].

In the CHIPS Act, semiconductor supply chains, "intellectual property" from research [2], and physical chips become the property that the United States government exercises power over through money. By defining legally who and what has access to these funds, the act produces definitions of personhood that includes some but unavoidably excludes others. Among these groups, it is clear that the personhood of corporations and research entities takes priority. Following the act's signing, many semiconductor giants have announced construction of new fabs and billion dollar business investments [6]. For example, Micron intends to invest up to $100 billion over the next 20-plus years to construct a new megafab in Clay, New York on Onondaga land [7]. By doing so, corporations reaffirm their right as legal "persons" to own the rural and native land on which to construct, the land from which silica is mined and processed, the financial support from the government, and the mental and physical work done by the people they employ. In contrast, individuals and marginalized groups are listed within the act, but their personhood remains unrealized. They do not have the same access to the property divided and distributed by the CHIPS Act, a say in what that property is or how its used, nor do they enjoy the power and influence that comes with ownership at that scale.

3. SETTLER COLONIALISM AS RATIONALE FOR EDUCATION AND RESEARCH

The rhetoric of advancement in the semiconductor industry is summarized by the word "growth." Progress is measured through constructing enormous "megafabs," creating tens of thousands of jobs, making "the largest private

investment" in a region's history, and increasing domestic production by x percent. By centering settler-colonialism within this myth that technological progress and growth is always beneficial, we see that it comes at the expense of the environment and communities. Unsustainable silica sand mining destroys the local ecosystem and causes a variety of health issues [8]. Fabs, mega or not, use extreme amounts of energy and water while producing pollutants that poison water supplies [8]. The semiconductor industry's expansionist claims of land and resources compound the effects of climate change, drought, and food shortages that disproportionately impact marginalized peoples [8].

Through the lens of extractionist logics, even though certain groups are presented in the CHIPS Act as potential beneficiaries or given special consideration, these people are tokenized. As corporations seek to expand facilities near certain schools and impact local education and research, these groups' potential to participate in the workforce is not highlighted in the name of equity. Instead, their labor becomes yet another resource to be extracted in order to feed the industry's growth. By offering financial incentive to create STEM programs and increase recruitment, the act calculates that the inclusion of black, brown, native individuals, and of women and veterans, will produce greater economic advantage that surpasses their exclusion. At the same time, the act establishes school partnerships, grants, and awards through a "savior" dynamic, characteristic of settler-colonialism, to "help" struggling communities by pushing them into the semiconductor workforce based on the values and institutions the government deems important.

By injecting funds into a variety of scientific research topics pertaining to the advancement of semiconductors such as purity, materials, novel applications, and AI, the CHIPS act shapes the questions asked by research groups and the results they produce. These results are used against foreign nations, bought and sold by corporations, and particularly used in military applications [2]. This process imposes settler-colonial ideals, such as adversarial competitiveness and a zero-sum mentality, reducing engineering progress in semiconductor technology to a binary in which one group's gain necessitates another group's loss.

Education and research becomes systems of control to ensure that a workforce with the "necessary" set of values and skills is readily available to maintain and expand the United States' ability to compete and further colonize semiconductor knowledge globally. The possibility for marginalized groups to "participate" in these systems does not allow scientific epistemology to escape the settler-colonial collusion that marginalizes these groups to begin with. The property that is created through research does not belong to the people who created it. The act does not encourage creating electronics that give back to the land and communities from which it readily extracts resources and labor, nor does it question the impact that new semiconductor technologies will have in increasing the technological gap between groups in different socioeconomic standings.

4. DECOLONIZING CHIPS: NATIVE FEMINISM AND STANDPOINT THEORY

We look towards Sandra Harding's standpoint theory and native feminist theory to reimagine the CHIPS Act's push for STEM education and semiconductor industry progression. By recognizing "sciences from below," utilizing strong objectivity, and focusing on decolonization and reciprocity, we can explore intersectionality in the creation and usage of semiconductor technology.

Sandra Harding's standpoint theory as applied to semiconductor R&D in a research institution or a corporation calls for the legitimization of the strong-objectivity model in "sciences from below." In this model, research in the sciences does not start from dominant structures of society. Rather, it starts from "the perspectives of economically, politically, and socially oppressed groups that can bring valuably novel insights to research projects" [9]. Harding states that the distinct homogeneity, or exclusion of certain groups, in research communities stems from the tendency of these communities to "attract and admit only certain groups of citizens with a distinctive set of elite social values and interests, and then train them into research practices that further advance such distinctive values and interests" [9]. While the CHIPS Act seems to support the inclusion of historically oppressed groups, it does not address the central flaw of only admitting people with the desired set of values and interests and training them in a way that fits into the current industry, in what proponents call "filling skill gaps" or a "workforce reskilling process" [10]. The

push for scientific research in the CHIPS Act is rooted in international competition and to keep increasing the economic and military influence of the United States. Instead, how these core motivators shape what questions are asked, who participates in the research, and who benefits from the result must be questioned. Then, through efforts to overturn them, we can empower those who are kept underprivileged by this structure and upend the idea that herding people into semiconductor education, research and industry is the only model in which semiconductor technology can progress.

Similarly, in "Decolonizing Feminism: Challenging Connections between Settler Colonialism and Heteropatriarchy," authors Maile Arvin, Eve Tuck, and Angie Morrill outline several challenges that native feminism theory poses to mainstream women's studies [11]. These challenges parallel many critiques of the institutions and educational systems that the CHIPS Act puts forth. One challenge posits to "actively seek alliances in which differences are respected and issues of land and tribal belonging are not erased in order to create solidarity" [11]. In the government's desire to pursue partnerships with MSIs and Tech Hubs normally excluded from the semiconductor space, they must make sure that these alliances are formed on equal footing, problematizing the settler's mentality of what help and "upskilling" mean. The government must address the reasons behind current points of conflict within these communities and how pushing for a STEM curriculum "may participate in the dispossession of Indigenous peoples' lands, livelihoods, and futures" [11]. This can be achieved by tracking where funding goes and who is in charge of those decisions, legitimizing grassroots organizations that supplement public education, or understanding why STEM learning is not a priority in communities where basic needs may not be met or where the curriculum fails to connect culturally or ideologically to the student population. A deeper understanding of environmental, gender, and technological reciprocity as pertains to the study of semiconductors and application of chips may be found by "recognizing the persistence of Indigenous concepts and epistemologies" [11]. It can begin the process of questioning how the study and production of chips can reciprocate and give back to the land and to the people in the community. It can reveal the strengths that different groups create in the STEM learning and engineering industry experience that exclusion and avoidance of said differences prevents.

By refusing erasure, but doing more than include, the CHIPS Act has the potential to support marginalized groups in creating and reclaiming self-sovereignty, definitions of ownership and property, and personhood as relates to semiconductor technology by their purposeful participation [11].

CONCLUSION

The CHIPS Act seeks to make big strides in advancing semiconductor industry growth and technology development while implementing DEI strategies through education and industry partnerships. However, the underlying logics involved in both the creation of the act and its goals are deeply rooted in heteropatriarchy, settler-colonialism, capitalism, and technoscience inevitability. These logics uphold and continue to strengthen the societal structures that have marginalized and oppressed the same groups that the act hopes to support. Using feminist frameworks such as standpoint theory and native feminism, we can problematize these logics and queer the foundations of the CHIPS Act. In research, standpoint theory emphasizes that in order to combat homogeneity within the sciences, the underprivileged groups should shape the questions asked by research based on the applications and results that they feel are important. Instead of fueling research for defense and economic purposes, the CHIPS Act can instead acknowledge and encourage "sciences from below." In education and industry, native feminism calls for creating alliances that recognize differences, allowing those who are marginalized to have the power to choose how they participate in semiconductor technoscience, empowering them through the reclamation of their personhood. It also offers reciprocity as a value in opposition to extractive capitalism, where recognizing Indigenous epistemologies can produce possible avenues into sustainability in the environment and in academia when it comes to silicon mining or expanding STEM curriculum. Queering the CHIPS Act opens up the door for nondominant ways of thinking about semiconductor progress and its intersections. We can engage in this process to iteratively and adaptively deconstruct the core values that have marginalized groups and create truly equitable engineering policy.

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