

Science in 'the storm': Reflections on politics and plant sciences today

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Abstract

What constitutes science? What is the relation between scientific practice and capitalist modernity? What are the responsibilities of scientists in the face of our planetary crisis? In 2016 the Zapatistas of Chiapas organized an event to reflect upon and discuss the practice and politics of science. This paper — based on a script of a presentation at the event — takes up these questions, drawing from radical thought and philosophy of science to consider science in our present conjuncture.

Key Words: science, politics, plant sciences, ConCiencias, capitalism

La ciencia en "la tormenta": Reflexiones sobre política y ciencias vegetales en la actualidad

Resumen

¿Qué constituye la ciencia? ¿Cuál es la relación entre la práctica científica y la modernidad capitalista?

¿Cuáles son las responsabilidades de los científicos frente a nuestra crisis planetaria? En 2016, los zapatistas de Chiapas organizaron un evento para reflexionar y discutir la práctica y la política de la ciencia. Este documento, basado en un guión de una presentación en el evento, retoma estas preguntas, partiendo del pensamiento radical y la filosofía de la ciencia para considerar la ciencia en nuestra coyuntura actual.

Palabras clave: Ciencia, Política, Ciencias vegetales, ConCiencias, Capitalismo

1. Introduction

[O]ur idea is neither to teach nor to 'show', but to provoke... to incite thought.

SupGaleano, *Critical Thought in the Face of the Capitalist Hydra*

What we call science today may be conceptualized in several distinct ways.¹ The common-sense conception, in which science is a rarefied field of discovery

¹This paper was initially prepared in Spanish for an invited presentation to the Zapatistas of Chiapas. Kristen Mercer was honored with an invitation to give a presentation at the first Zapatistas *ConCiencias* event in 2016. Kristen Mercer invited Joel Wainwright to join in the preparation of the script for the presentation, which is presented here in translation and with amendments. The paper's polemical tone reflects the emergence of our text as a script for an oral presentation before a non-academic, political audience. Since the Zapatistas *ConCiencias* brought scientists together with Zapatistas to reflect upon and discuss the practice and politics of science, we decided to focus our presentation on the political economy of agricultural research amidst what the Zapatistas call 'the storm': the present global economic, ecological and political crisis. We selected this topic because of our expertise and because we were responding to questions posed by the Zapatistas (ELZN 2015) in their call for a renewed, radical analysis of science. We were particularly inspired by three questions: "Do scientists wonder if they are doing science or something else? Do you do research and advance solely motivated by scientific curiosity? And, is the paradise-like island of scientific endeavor safe from the storm?"

dominated by men and mathematics, is the wrong starting point. If instead we begin — as some liberal philosophers of science do — by defining science as a specific set of practices (for instance, positivist-empiricist epistemology and/or hypothesis-testing) then science can legitimately be defined as a *modern* phenomenon. This liberal position may be criticized from a more radical and historical perspective. For one thing, the liberal view easily slides into the (false) thesis that 'science is modernity' or the even-more-dangerous thesis that 'science is *Western*.' On these lands we now call 'Chiapas' (and we should never forget that these lands were given other names long ago) people shaped maize over millennia; built cities with complex astronomical reference-points; calculated with the use of zero; and so on. By any *meaningful* conception of science, people in Chiapas have been thinking scientifically for as long as they have been here: longer than there has been a 'Chiapas.'

This raises a question that seems simple but proves to be quite complex in its dimensions: how can we affirm science as a universal phenomenon — where science is available to all — but also define it in some way that distinguishes it from simply thinking, or looking carefully at the world? It requires that we historicize science, that is, that we grasp the long history of science, in all its variations, while also taking account of the specific ways science has been both extended and deformed through capitalist modernity. Emphasizing *capitalist* modernity is essential, for two broad reasons. First, the political-economy of capitalism has deeply influenced the form and activity of scientific practice. Second, the flourishing of the sciences has played an essential role in deepening capitalist social relations.

Nevertheless, those who criticize capitalism should not reject science *per se*. To do so is not only to commit to anti-scientific reasoning. It is also to give up on the radical potential inherent in scientific practice. Thus, it is important to consider how and under what conditions science could advance the radical aims of subaltern social groups. We share the commitment

to facing these questions. We also share the recognition that scientists alone cannot create the conditions necessary for a science that genuinely serves humanity.

This is how we understand the premise of the events that the Zapatistas of Chiapas have hosted, namely *ConCiencias por la Humanidad* (hereafter ConCiencias). The name provided for this event, translated most immediately as 'With the Sciences for Humanity', can be understood as a call for a science that is radically conscientious and just (Sp. '*conciencia*' means 'conscience'). The pair of ConCiencias meetings in 2016 and 2017 brought scientists of many nations and disciplines together with Zapatistas to improve science literacy and practice in Zapatista communities while also stimulating dialogue about how science for humanity could serve as a "key column to build a new world, better, more democratic, fair and free" (Moises and Galeano, 2016, p. 1). Such discussion is especially important in the face of what Zapatistas call 'the storm' (see Reyes 2015): global social, economic, and ecological crisis. The talks by the scientists at ConCiencias address their scientific practice and findings, of course, but also thought on the intersections of science, society, capitalism, and the storm. ConCiencias, therefore, reflects a demand for a distinctive practice of science as well as a provocation to revisit our conception of science.

Contrary to the common sense and liberal conceptions of science, we argue that we can grasp science as a social process that reduces the not-known through creative questioning and the critical comparison of results. So understood, science is neither modern nor Western, but universal or at least universally possible, though not always enacted. When practiced, science means reasoning in collective-critical fashion. Consider the practices we associate with science today: comparing data, citing other work, 'peer review', and so on. These are formal ways of building claims together.² It is on this ground — the 'collective' character of science — that we can fend for science's distinctiveness, for it is what allows scientific reasoning to be defined as universal (anyone can do it!), but also

² In adopting this view, we draw from Antonio Gramsci's prison notes on science (see Gramsci 1979, 1995). On Gramsci's conception of science, see Wainwright and Mercer (2009), Nieto-Galan (2011) and Antonini (2014). On the virtues of Gramsci political ecology, see Mann (2009).

specific (the validity of a specific claim is determined by comparison of results, peer review, and so on, within a specific network). Science is not a *thing* at all, but a *conception of the world*. The distinctiveness of this conception of the world lies in its manner of testing claims through negation, through reasoning with *an other*, i.e., through reasoning *socially*. The public presentation of evidence to others to substantiate claims is fundamental; science is validated socially. No one proves anything alone. Even the accomplishments of geniuses are only marginal elaborations of humanity's knowledge.

Here, we unfold our argument in three steps. First, we reflect upon science, modernity, and the political economy of capitalism. We examine how science in the modern university has been formed by the state and capitalism over three distinct epochs (we live in the third, the 'neoliberal' era of capitalist history). Second, we focus on the particular field of science — agronomy and agroecology — with which we have the most direct knowledge and in the country and context in which we primarily operate: in US agricultural research universities. Third, we conclude with utopian reflections on science and political transformation, for instance, in Zapatista communities.

2. Science in the neoliberal capitalist era

One of the many accomplishments of Zapatismo has been to elevate the critique of neoliberalism into the left's general political intuition.³ Thanks partly to their struggle, we recognize that we are living through a neoliberal epoch of the history of capitalism. Before we get into some of the problematic symptoms of neoliberalism on academic science, it is important to explain what we mean by 'neoliberal science'. While

there has been an *intensification* of pressures on scientists since the consolidation of neoliberalism⁴, the fundamental demands of science by capital have changed little since capitalism took hold of Western Europe in the 1700s. What *has* changed in the neoliberal era is not the essential character of capital nor of science but their *interrelation*. The change we recognize in their interrelation — which has brought us to a point where it seems like science has 'become neoliberal' — has not been driven by changes in the nature of science *per se* but rather in its political economy. To put it briefly, we could say that the role of science in capitalism has changed as a consequence of three fundamental processes, each unfolding on different temporal rhythms.

First, there is long, slow process by which the technical side of production (machinery and computation) has grown relative to labor power. Marx (1867) calls this ratio of living labor to machines the "organic composition of capital"; the extreme point of the ratio, which capital is driven toward, is a world where all the production is done by robots; that these robots would be owned by a small capitalist class who would have no one to sell their commodities to is one of capital's prime contradictions. Contradictory or not, this process drives science onward, with its 'translational' edge at front, since it is by technical advantages (more efficient ways to make better mousetraps) that some capitalists are able to secure a marginally larger share of the surplus value produced by labor. Second, the social costs of creating a competitive, scientifically-literate mass of labor power — to create and operate the machines, among other things — has become increasingly costly, during a neoliberal period when the state's capacity to subsidize public education has declined⁵. Third, advancing science is inseparable from

³ Prior to the Zapatista's first Intercontinental *Encuentro* ('For Humanity and Against Neoliberalism') in July/August 1996, 'neoliberalism' was used only rarely in leftist circles in the US. Suffice to say, this changed.

⁴ We agree with Arrighi (2010) who dates the global consolidation of neoliberalism to the 1970s, recognizing that the process has unfolded unevenly. In the US the decisive shift to neoliberal political values came with the election of Reagan in 1980; in economic policy, between 1973 (with the lifting of the gold standard) and 1979 (Volker shock). In Mexico the decisive decade for the adoption of neoliberal economic policy was 1983-1994, with the peso crisis, liberalization of trade, attacks on *ejidos*, NAFTA, and so on. The political shift therefore occurred within the PRI, not between two parties.

⁵ Arguably, this is the only one of the processes specific to the neoliberal period. Neoliberalism, a political ideology specific to the period of the ascendancy of finance (C-M' or M-M') relative to production (M-C), does not require scientifically literate citizens. Yet the impulse to create such citizens — which marks a break from earlier periods of capitalism — can be explained not only on economic grounds but because the self-fashioning, entrepreneurial subject (so central to neoliberalism qua political ideology) is partly based on the liberal conception of the inventive scientist engaged in creative experiments with potential commercial applications.

the competition by states for superiority in the creation of advanced weaponry. From physics to geography, still every scientific discipline grows under the shadow of state tutelage and funding: money provided in the hope of turning scientific insights into military advantage. The US is an empire not simply because of its scientific achievements, but it must sustain its scientific achievements to remain an empire.

Taking these three processes together (and setting aside the Marxist jargon), the implication is clear. Science has not liberated humanity. Indeed, under capitalism, it often reinforces the anti-democratic and essentially authoritarian and destructive forms of power that dominate our world. We should be careful not to limit our critical thinking to the neoliberal epoch. Capitalism predates neoliberalism, science predates capitalism, and the basic problems we face — inequality, injustice, imperialism — are even older. We need a longer view, one that recalls the words on the opening page of Horkheimer and Adorno's *Dialectic of Enlightenment*:

Enlightenment, understood in the widest sense as the advance of thought, has always aimed at liberating human beings from fear and installing them as masters. Yet the wholly enlightened earth is radiant with triumphant calamity (Horkheimer and Adorno 1947: 1).

The capitalist world is fully engulfed by science and not to the benefit of all. The globalization of capitalism could never have been achieved without the dynamism propelled by scientific reasoning and its technical accomplishments, harnessed to capital and the state: malevolent forms of power that dominate our world. Still, we emphasize, science is not capitalism. As the Zapatista ConCiencias project reminds us, we must insist upon their distinction so that we can force their separation.

The reorganization of European social life along capitalist lines transformed the nature of science there in two interlinked ways, which subsequently have come to be taken as universal qualities of science. On one hand, the 'adoption' of science by capitalist societies brought about the unification of diverse

traditions into one global community with uniform scientific reference points, such as mathematics, the periodic table, and the laws of physics. On the other hand, capital 'rationalized' science, striating and coordinating its activities through well-defined disciplines with specific objects (for example, biology would study 'life,' meaning Darwinian evolution, DNA, and so on: see Levins and Lewontin, 1985). Taken together, science has been one of the fundamental elements of the cosmopolitan reordering of the world, perhaps its most 'humanitarian' element. Yet science wears the double mask of Janus. Consider three illustrations well known in Zapatista territory. First: we can now communicate instantaneously with colleagues around the world; yet states spy systematically on these transmissions, digitally archiving our private thoughts and interactions. Second: physics decoded the nature of matter, yet delivered nuclear weapons to the most powerful states. Third: arguably the greatest 'discovery' of natural science in our lives has been to diagnose the myriad ways that humans are transforming the Earth. Yet science cannot reverse climate change or the sixth great extinction. To be sure, scientists must document our planetary ecological crisis that threatens innumerable species and the current form of human civilization. Nevertheless, the sort of social and political transformation necessary to halt this crisis is not a scientific task. We could add other illustrations, but the pattern is clear: science promises *liberation*, but in a world dominated by capitalism and the form of sovereignty enacted by authoritarian capitalist states, science either accentuates the crisis or, at best, ameliorates it — contributing little to our collective liberation.

3. Historical transitions

The shaping of academic science as practiced in US universities to advance the goals of capital has proceeded unevenly. Bill Readings's classic (1996) *University in Ruins* explains that the modern university has emerged in three historical phases, each with its own defining goal or ideal. In the earliest phase, which coincides with the birth of capitalist social relations, the University — still relatively small as a social institution, pre-modern in style, and affiliated with the church — is principally a training ground for

elite culture. The goal is good men of spirit. Scientific discovery plays a small part.

In the second phase — roughly from the mid-19th century to the 1970s — the University becomes increasingly national, practical, secular, and commercial. Its purpose is to blend learning with practice, arts with science, thinking with business. This is the period when mass education of basic math and science becomes the norm, when the concept of ‘social science’ is invented, and when business schools are created inside Universities (against the wishes of the ‘old guard’, reflected in the US by critics like Thorstein Veblen). The economic function of the University in this period was the creation of a large pool of ‘trained labor power’; its political aim was the stabilization of the liberal hegemony for the capitalist nation-state. Science was central to both.

The university largely succeeded in fulfilling these functions, at least in the US, but history has moved on. Since the 1970s, our neoliberal phase, the university has lacked a coherent ideal. As we will discuss, we face relentless demands to generate ever-larger grants and to commodify the results of scientific labor. (The pressure to publish findings in the most prestigious journals is related, since highly-cited publications increase the likelihood of success with the next round of grants.) Yet commercialization was not our original mandate. The University at which we teach, for instance, is a corporation: but it is a not-for-profit, public corporation, which has the mission of ‘creating ... knowledge to improve the well-being of our global communit[y]’ (Ohio State University [no date]).⁶ There is much to be celebrated here.

To say the least, it is not always easy to reconcile the University’s mission with the actual practice of commercialization of some portion of the research produced. To square the circle, the concept of ‘excellence’ has emerged in place of a coherent ideal. That is what universities do today, produce ‘excellence.’ Faculty are excellence producers. Of course, in itself,

‘excellence’ means nothing. And this is precisely the point: the empty concept centers a system that cannot articulate its purpose. Consider here Thorstein Veblen’s analysis of *The Higher Learning in America* from one century ago:

Taken as a business concern, the university is in a very singular position. ... Its only ostensible reason for being, and so for its being governed and managed, competitively or otherwise, is the advancement of learning. And this advancement of learning is [not] a business proposition; and yet it must, for the present at least, remain the sole ostensible purpose of the businesslike university. In the main, therefore, all the competitive endeavours and maneuvers of the captains of erudition in charge must be made under cover of an ostensible endeavor to further this non-competitive advancement of learning, at all costs. Since learning is not a competitive matter; since, indeed, competition in any guise or bearing in this field is detrimental to learning; the competitive maneuvers of the academic executive must be carried on surreptitiously, in a sense, cloaked as a non-competitive campaign for the increase of knowledge without fear or favour (Veblen [1918]: chapter 6 [no pagination]).

Although we all ostensibly pursue ‘excellence’, and the motives driving academic scientists today vary — some scholars directly support the interests of particular corporations or of the state (including the US military) — the crucial question transcends the interests of individuals. Does the university bear a specific social function in a capitalist society? Certainly it does: through the reproduction of certified labor power, the production of new commodities or methods to increase profitability, and various contributions to the hegemony of ruling ideas.⁷

The plant and agricultural sciences

As scientists who study ecology and agriculture at a public university in the US, we have seen how

⁶ “The University is dedicated to ... [c]reating and discovering knowledge to improve the well-being of our state, regional, national and global communities...”. For a thoughtful analysis of the corporate character of the modern university, see the final chapter of Barkan (2013).

⁷ We emphasize that we are generalizing about research universities in the US and we recognize that these dynamics play out differently in different places.

this social life of science plays out in the choices people make about what to study and the sources of funding they pursue. The recognition that our science reflects the capitalist character of modern society puts into relief the very possibility of other kinds of science embedded in other types of society, or “en otro mundo en que quepan muchos mundos” [in an other world in which there fit many worlds]. In this spirit we highlight some of the trends playing out in academic agricultural research in the US. We consider long-term trends that have shaped scientific practice and consider the effects of neoliberalism for science in the public research universities of the United States. We focus here because it is where we live and work. But the practice of science in the US university has global consequences, especially since the US system is often seen as worthy of emulation by others, including in Mexico.

One practical reason for the creation of the large public research universities in the US was to improve capitalist agriculture (Kloppenborg 2005). These land grant universities (so-called because the Federal government made grants of land to subsidize their creation) had the paired mission of teaching the children of the mostly rural population along with performing research to improve agricultural production, which would increase the capacity of the US to produce and sell farm commodities. From this initial phase, the goal was to create knowledge that could be directly applied by farmers and agricultural companies. Thus, the research was, at its conception, ‘translational’ or basic research whose application might generate direct benefits for businesses.⁸ This translational agronomic or agroecological research produced within US universities could inform various kinds of farming systems — from large production of genetically modified soybeans to small-scale organic vegetable production. Such agronomic or agroecological research would emphasize the determination of best practices to optimize production and economic gain, in the case of agronomic work, and, additionally, environmental and social benefits, in the case of

agroecology (see Jardón Barbolla 2018). Nevertheless, with translational research the emphasis remains ‘impact’, where research questions are oriented toward expansion and refinement of the prevailing industrial farming systems.

Yet not all research practiced in US Land Grants ‘translates’ into commercial sales (Birch et al. 2010). There has always been room in the university for basic research that helps explain the processes underlying agroecosystems and that may not have immediate, direct application. For instance, translational work might include studying how different rates of compost application impact organic squash production, while basic research in the same system might include understanding the more basic processes whereby nutrients stored in organic matter are released and utilized by plants. Therefore, the research done in the US agricultural universities is diverse, but has the uniting theme of working towards improving US production, and thereby economic growth (Kloppenborg 2005). This is also generally true of research aiming to increase the ecological sustainability of US agriculture, since innovative practices to diminish environmental impacts must not affect profitability.

These trends are also apparent in the trends with major funding agencies. The neoliberal period has seen shifts in the funding for higher education through the state. Although much research had previously been financed directly by the state, professors are increasingly pressured to compete for external funds (from state agencies and private) sources to fund their research (Mohrman et al. 2008) — to live, in short, entrepreneurial lives (Etzkowitz et al. 2000). Consider the National Science Foundation (NSF). The number of proposals submitted to the NSF increased rapidly over the past decade (and the number submitted specifically by women doubled). Yet the amount of funding granted by NSF has remained static or increased only slowly.⁹ In this economy, many faculty seek more dependable sources of funding, such as the agricultural industry or particular commodity groups.

⁸ Levins and Lewontin’s (1985) study of biology, and Kloppenborg’s (2005) account of plant genetics, are germinal sources. A robust literature on political ecology, science and agriculture — too large to review here — has been written by geographers. See, e.g., Prudham (2003); Rocheleau (2008); Wainwright and Mercer (2009); Engel-Di Mauro (2014); Graddy (2014).

⁹ These data are disputed. See also Howard and Laird (2013).

With declining public funding for higher learning, administrations look to extract greater indirect costs (as high as sixty percent today) from research grants to support university infrastructure (buildings, electricity, and so on). Effectively this amounts to a tax on the research. Meanwhile, costs of research also tend to increase over time. Howard and Laird contend that the “buildup of the scientific infrastructure in universities and colleges ... has now outstripped the funding capacity of the federal government” (2013: no page). The search to find funding to support laboratory machinery and labor power requires enormous amounts of time and energy that could be used for some other social purpose.¹⁰ Faculty are responsible for more of their graduate students’ salaries, benefits packages, tuition, and fees. Grants are needed to support scientific education on top of research. Sources of funding that do not pay indirect costs are discouraged.

These trends have important implications for the practice of science. When faculty are disciplined in subtle ways for failing to ‘bring in money’, they experience greater stress and feel a reduced sense of their own worth. More generally, the labor spent seeking funds comes at the expense of other pursuits that may be more useful to the public, including publishing results or teaching students. Against this, many universities seek to increase the efficiency of searching for grants and ‘translating’ the research into additional funding. Every research university has a division devoted to facilitating patenting — to increasing the number and value of patents generated by faculty. Some argue that “[t]he potential to take advantage of the infrastructure and talent on university campuses may be a win-win situation for businesses and institutions of higher education” (Howard and Laird, 2013: no page). This ‘win-win’ is a euphemism for the use of public assets (scientific infrastructure) for private gain (business). In effect, faculty at public universities are encouraged to run their science research programs as competitive capitalist enterprises.

Yet, we contend, a more significant loss is intangible: the narrowing of questions, the shrinking horizon of thought. For treating science as a business inherently requires changing the definition of valid, important, ‘worthy’ research along capitalistic lines. This may be explicit (‘patentable’) or euphemistic (‘translational’). Regardless, faculty feel less liberty to decide how to advance their research programs based solely on their knowledge, on the public interest, and on their critical conception of the world. Rather, their programs become driven by chasing money. The winnowing down of viable research programs affects the motivations and scientific choices of researchers and influences what array of projects are funded. Research that takes an international perspective or is more basic in nature has become more difficult to fund, and thus, less common.

Let us cite an example near to our hearts: the study of crop landraces and how they have adapted to their environments in centers of crop origin. This topic is of less interest to funders than would be studying those same landraces for interesting adaptations that could be used for improving US crops and thereby US agriculture. Even agencies or foundations that have interests in international work can have their own priorities driven by current trends. For instance, many foundations funding international agricultural research emphasize work in Africa over the Americas, utilize a capitalist perspective to validate the work, or require direct application to US agriculture. There is little interest in the export of domestic knowledge to other countries or distant contexts unless it helps build strategic partnerships (read: improves economic interests). In short, where there is not money to be made for US interest, the chance that research is prioritized declines. As we all know, there are many worthy if not essential issues that science should address that would not be emphasized within the current agricultural academic atmosphere in the US. This bias in the funded research reinforces pre-existing divisions and disparities.

¹⁰ E.g., at the US Department of Agriculture’s granting arm, some panels fund ~2% of applications. With over 200 proposals submitted per year on average, the labor spent writing, processing, and reviewing those proposals results in a handful funded. Our point is not to bemoan the difficult lives of scientists. Even if we accept the social value of competitive processes for decisions regarding public funds, a competition with such a low success rate commits society to a significant waste of scientific labor time that could be oriented toward social problems.

Although we are committed to the struggle for a different hegemony in the US, and therefore a different university (among other things), we are not particularly enthusiastic about the role of academic or scientific politics in changing the US today. Briefly put, the hegemony of academic life — the influence of the state and capital combined with the absence of broad-based, radical social movements — results in an academic environment where radical change is hard to imagine. Of course, things could change rapidly. The US empire is in decline, and global capitalism is in crisis — so radical change is possible. Where can we find hope?

4. Conclusion

Organize yourselves, brothers and sisters. ... Start from how you live and move from there.

Subcomandante Insurgente Moisés,
in EZLN (2015: 71)

It is only logical that we now ask about the conditions of possibility for genuinely radical scientific practice — one that is not neutral with respect to capital and state, but can fulfill science's potential for liberation. Indeed, we must intensify this utopian line of thinking. But while scientific knowledge is inherently open (and therefore, abstractly speaking, democratic), this does not at all mean that anyone can do any science anywhere. Similarly, the sort of scientific questioning that the Zapatistas are calling for cannot happen just anywhere, or else it may lapse into mere idealism. The idealist conception of science — a component of much liberalism — treats science as something generically good because it involves an objective search for the truth. But there is no way for anyone to be completely neutral and objective: we are social beings. The claim to neutrality and objectivity is typically a reflection of privilege or (more conservatively) a refusal to engage with radical demands for social change. That is to say, given that our world is divided by massive inequalities of power and wealth, the refusal of the privileged intellectual to stake a position amounts to consent and conformity to *status quo*. On this point, consider this statement by the great scientist and radical critic, Noam Chomsky,

speaking about US scientists in the era of the US war in Vietnam:

Sometimes it's argued that the universities should just be neutral ... [T]here's merit in that [position,] ... but in *this* universe what that position entails is conformity to ... power. ... Let's take some distance so we can see things more clearly. Back in the 1960s, in my university, MIT, the political science department was carrying out studies with students and faculty on counterinsurgency in Vietnam ... [Their work] reflected the distribution of power in the outside society. The U.S. is involved in counterinsurgency in Vietnam: 'it's our patriotic duty to help ...'. A free and independent university would have been carrying out studies on how poor peasants can resist the attack of a predatory superpower. Can you imagine how much support that would have gotten on campus? Well, okay, that's what neutrality turns into when it's carried out — when the ideal [of scientific neutrality], which is a good ideal, is pursued unthinkingly. It ends up being conformity to power (Chomsky 2008: 24; see also Chomsky 1968).

If our universities were genuinely free and independent, therefore, we would find the production of serious works contributing to the defense of poor peasants, including the Zapatista communities. Yet that is rare. Instead we find a preponderance of conformity to power.

Just as we may find capitalism as practiced by the US state to be imperial in nature and creating an inherent orientation to the science practiced, other forms of political thought can encourage other kinds of science. For instance, many of us within the field of agroecology have been inspired by Cuban agriculture and food system (e.g., Altieri et al. 1999; Rosset et al. 2012; Nicholls and Altieri 2018), research that is embedded within the Cuban state and socialism. We were fortunate to spend a summer in Cuba in 2000 learning about agricultural research supporting all kinds of diversified farms. It inspired us to see how agroecological research could be leveraged to improve systems that were not tied into a capitalist economy. Having studied in Minnesota where intensive, large-

scale agriculture is the norm, we had seen so many useful agroecology methods dismissed prior to testing because they were not expected to be able to improve farmers' modest economic margins. Seeing the state encouragement of agroecology in Cuba and the open-mindedness of the farmer population proved that agricultural research could support diversified agricultural systems, innovative use of new species, and emphasis on holistic benefits to farmers, important tenants of agroecology. It helped us to see that another world was possible and that agroecology has a critical role to play in its construction¹¹.

For us, this only affirms the potential of science. To reiterate, science is not reducible to Western rationality nor the capitalist mode of production. The way it has been organized within capitalist societies is not the only path. All science occurs within a political and economic reality, which creates an inherent orientation that prioritizes certain questions, and certain methods, over others. Some questions and answers are more valuable than others. We should be able to imagine, therefore, forms of practicing science that are more just and equitable. We are far from the only scientists thinking in this way. The scientists convening at ConCienias, and those relaunching Science for the People, show that science can grow out of social movements. It can be claimed for creativity, inquiry, learning, beauty, justice, equality, and holistic social benefits. Importantly, it can be practiced anywhere too. Such a science for humanity would be exciting to see flourish within Zapatista communities. We must envision the science we need in the face of the crisis. Such research could encourage learning about the natural and agricultural resources that generate real wealth for Zapatistas. Yet the conditions for science to serve 'Zapatismo' and other radical ends cannot be created by scientists alone. If they are to emerge, they will be generated through political struggles.

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¹¹ See, inter alia, Wezel et al. 2009; Jardón Barbolla (2018); Mercer (2018); Nicholls & Altieri (2018). Partly because Zapatista livelihoods are predominantly agrarian, the science of agroecology received emphasis in ConCienias.

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