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From Pathological Bifurcations to Meaningful Planetary Change Agents

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Abstract:

This chapter discusses and analyzes the phenomenon of pathological bifurcation among French engineering students. Pathological bifurcation occurs when sustainable development succeeds in inspiring student activism, but that passion expresses itself destructively. The chapter answers two questions. First, we interrogate whether pathological bifurcation is a product of lacunae with current SD education practices. Having answered affirmatively, we reflect on how to treat this diagnosis. Our suggestion is that if SDG related curricular innovations are desirable, so too is an extensive grounding in the traditional teachings of what we call planetary humanities. These are lessons drawn from around planet inculcating the very traditional moral art of controlling one's passions in such a way as to best foster collective flourishing.

Keywords:

curriculum theory, moral education, sustainable development, engineering education, bifurcation, professionalization

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1. Bifurcation

On May 10, 2022, six new engineers stood up at the graduation ceremony of the prestigious French engineering school AgroParisTech, announced that they were leaving engineering. They urged their fellow students to join them in *bifurcating*—a French word that designates a “trajectory rupture” (Veltz, 2022, p. 15). As a technical term bifurcation comes from systems theory, but in contemporary parlance its usage is closely tied to radical political environmentalism (Durand & Keucheyan, 2024; Stiegler & Collective, 2021; Truong, 2023). Usually, the rhetoric of bifurcation is aligned with the embrace of revolutionary degrowth communism (Hickel, 2020; Parrique, 2022; Saito, 2024). Most Bifurquers are hostile to sustainable development. They consider it depoliticizing, neo-colonialist, and based on an incoherent belief in the reconcilability of growth-oriented capitalist economies with urgent ecological and social priorities (Latouche, 1994, 2004; McKenzie, 2012; Sutoris, 2022). This hostility was in full evidence in the speeches of the Bifurquers. They explicitly rejected the UN’s, the school’s, and many engineering educators (Castano Rodriguez et al., 2022), core message on the role of the engineer within a sustainable transition: “We do not see ecological and social devastation as ‘issues’ or ‘challenges’ to which we should find ‘solutions’ as engineers...innovation will not save anything but capitalism” (bifurquent, 2022). In consequence, they, like many others, decided to abandon what they judge to be a corrupt system in favor of ecotopian back to the land experiments and radical politics, joining groups such as *Soulèvements de la terre* and Extinction Rebellion (Meyer, 2022; Soulèvements, 2023).

This rejection of mainstream efforts to address the Anthropocene was not an isolated case. Recent sociological studies show that bifurcation is a growing phenomenon among French students (Bouzin, 2022). Admittedly, Bifurcation remains a statistically marginal phenomenon. Yet radical activists do play a disproportionate (and often negative) role in shaping discourse and the public per-

ceptions around ecology (Badullovich et al., 2024; Scheuch et al., 2024). For this reason, we will call the type of bifurcation performed by the Bifurquers ‘pathological bifurcation’. A pathological bifurcation is an attempt to alter or change a socio-ecological system for the better which performatively misfires—generating more negative reactions than positive actions on climate. Of course, whether these actions have truly misfired is a judgment call. Yet our view is that the bifurcation we need will not involve a small number of individuals breaking off from society or violently attacking its institutions but will involve a mass collective transformation of sociotechnical practices. We hold this perspective to be substantially compatible with the project of sustainable development (Arora-Jonsson, 2023).

While we do not endorse pathological bifurcation, or nor do we hope that it becomes more widespread, we do think that it raises interesting questions regarding the state of SD education initiatives in engineering schools. We believe that pathological bifurcations suggest that current efforts have been effective in inspiring passion and knowledge in the students, but they also suggest that minor pedagogical reforms, what Fisher et al. (2006) have called mid-stream modulations, are necessary. To further shed light on the phenomenon of pathological bifurcation and the possible responses that it might elicit among educators, this essay thus discusses the following questions:

- A. Is pathological bifurcation a product, if arguably a dysfunctional or unintended one, of SD education initiatives?
- B. If so, how might we better enter into a dialogue with potential and actual Bifurquers so as to help them to better direct their passion for change?

2. Is Pathological Bifurcation a Result of SD Curricula?

It is reasonable to suggest that the Bifurquers are a product of their education. On a purely local level, the critical rhetoric (if not the specific actions) of the students echo discourses found in publica-

tions by their professors at AgroTech (Missemer & Levrel, 2023). Speaking more generally, there exist multiple discussions of SD and Anthropocene education which precisely name fostering bifurcation and political engagement as its objective (Moreau, 2021; Silova, 2021; Sutoris, 2022). This is true even in the generally more socially conservative and technocratic engineering education literature. For example, Kohn Rådberg et al. (2020, p. 23) have called for a rupture with “business-as-usual practices” while Rosén et al. (2023) have insisted that achieving sustainability will require “transgressing” institutional norms. In this way, we can say that even if most educators remain committed to institutional reform, and so have a different conception of bifurcation from the Bifurquers, their language indicates the contrary.

Many Bifurquers testify to experiencing feelings of “cognitive dissonance” (Lefebvre, 2023): a profound sense that there is a disconnection between contemporary green rhetoric and institutional practice. In light of the above, one might perfectly well suppose that the general rejection of engineering and even civil society within pathological bifurcation derives from a judgment, perhaps best articulated by Greta Thunberg, regarding the hypocrisy of the educational system (Ross, 2021). We talk about the climate crisis, we acknowledge that there is a need for radical action, yet we fly to conferences and we drive our gasoline powered automobiles to school, which is to say that we have not acted in such a way as to rapidly achieve the bifurcation that everyone seems to agree is necessary. In this sense, the feeling of incoherence and frustration which drives the students to radicalization is very much a mirror of real social contradictions. We can also say that the contents of our courses also serve to heighten this sense of disorientation. If some percentage of SD education, particularly in engineering schools, is narrowly technical, much of what the students encounter in the more society and culture-oriented part of their education serves to undermine the promise associated with these subjects by encouraging students to regard the “technofix mindset” critically (Jickling &

Spork, 1998). In this way, SD curricula, particularly in engineering schools, can appear as performative contradictions.

Current ways of narrating the history of our present moment such as the Anthropocene, Capitalocene, and the Plantationocene can also serve to increase student's sentiment of cognitive dissonance (Federau, 2023; Hook, 2023; Pedersen et al., 2022). These grand narratives frame normative Western ideas about economics, science, technology, and humanity as the driving forces responsible for the planet's disorders. Encountering these dark realities is critical to any climate education (Lysgaard et al., 2019). So too are necessary efforts aimed at increasing feelings of responsibility and passionate engagement (Kolmos et al., 2016; Leinfelder, 2013; Livingstone, 2019). Yet no one would deny that common reactions to these horrors and the immensity of our responsibility for them include climate skepticism, hopelessness, or indifference (Wilhelmsen et al., 2023). This can lead us to nihilistically regard nearly all aspects of our current values and social order as hopelessly ecocidal (Vioulac, 2024). Obviously, such nihilism can also generate violent passions, profound shame and anger, as well as a deep loss of faith in human nature and in the legitimacy of existing institutions. All of this is manifest in the choices made by the Bifurquers.

Christoph Wulf has argued that traditional, humanistic approaches to education (*Bildung*) have aimed to teach learners how to "reconcile themselves with the contradictions of their existence" (2022, p. 4). That ought not to be understood as repressing those contradictions, but rather as transmitting to them to traditional knowledges which help one to acquire the kinds of skilful coping skills which have historically allowed indigenous and other peoples to survive difficult times (Whyte, 2018). Recent work in education science has begun stressing the need to address phenomena such as earth sickness, solastalgia, solastalgia, environmental despair, and eco-anxiety within the Anthropocene classroom (Gienger et al., 2024). Less work has been done on anger and shame, two emotions which are manifest in the discourses and actions of the Bifurquers. Or rather,

and to be more precise, the presence of these emotions in Anthropocene classrooms has been regarded less as a problem than as means pursued for the sake of fostering activism (White et al., 2024). Nevertheless, it may not be inappropriate to wonder whether activist teaching for activism has been too indiscriminate. The moral philosopher Owen Flanagan has recently raised questions regarding “how we do anger and shame” (Flanagan, 2023, p. xiv). Based on extensive ethnographic as well as scientific evidence, he argues that many older cultures individuals had more socially healthy ways of performing these potentially disruptive and dangerous passions. Passing on this sort of knowledge regarding moral character—often via stories and the recounting of exemplary historical episodes—has long formed a core part of moral education in most cultures. Given the well-documented changes in how we perform anger, we feel that it is justified to wonder whether we have not become better at generating student anger than at teaching them to cope with it.

This raises yet a third way in which sustainable development pedagogy may be contributing to pathological bifurcations. Not only are we precisely teaching our students to revolt because we are encouraging them to regard our values in a devaluing way, but we are also changing our curricula in such a way as to accidentally remove educational elements which previously would have served to form moral characters. While it is typical to imagine reforming educational systems towards sustainability as a task to be undertaken, and likewise typical to urge a need for radical reforms, it is far less characteristic to reflect on what elements of curricula, quite apart from the specific exigencies of SD education, need to be sustained. In other words, there is a great deal of work aiming to isolate key SD competencies (Beagon et al., 2023; Wiek et al., 2011), there is less work focused on the compromises incurred when putting in place ambitious new SD-oriented programs. Is it not possible that in our rage to reform curricula, in our passionate desire to change everything to save the planet, we may have at least partially, to quote Theodor Adorno, “thrown out the baby with the bath wa-

ter”(2003)? Could it not be the case that the older approaches to education which we have replaced were precisely valuable because they helped us to cope in socially acceptable ways with the more tragic and frustrating aspects of existence?

It thus is plausible that SD education is actively contributing to pathological bifurcations. One way of confirming this is to acknowledge that bifurcation occupies a grey area in SD education reasoning. SD educators have always understood themselves to be teaching against ignorance, indifference, and skepticism. They wanted to create—progressively or via revolutions—a bifurcation towards sustainability. Teaching in such a way as to counteract student bifurcations can thus appear contradictory: a source of cognitive dissonance. Does not branding the Bifurquers activities pathological amount to conservatively resisting the tradition, in effect justifying the continuation of business as usual? What if history judges the activities of the Bifurquers as visionary? What if the best thing for the planet would be for everyone to go out, quit their jobs, join cooperative farms, and set out to wage a war on commerce and industry? Regardless of how much we ameliorate our anticipation competency, no one really knows. It is a fact that because we don't know what the world after the bifurcation may be like, we also find it hard to pass judgment on the right means of arriving there. What we agree on basically comes down to a consensus regarding where we do not want to go—towards and uninhabitable planet. Addressing pathological bifurcation is a difficult moral dilemma for Anthropocene educators. It brings us face to face with our own contradictions and uncertainties, with our own tendency to lapse into nihilism.

Yet most of us would agree that not all means are good. It is unquestionable that within most societies youthful rebellion is considered anti-social, and more than this, a generally poor way of arriving at one's ends, if one's end is harnessing one's passion, shame, and righteous rage to bring about lasting change. While we can admire the heroism of speaking truth to power, we can also admit that

pragmatism has generally been the most effective approach to effectuating social change. Being right about something has rarely been sufficient. It takes a great deal of character and effort to bring about meaningful change. We feel that young engineers who are attracted to pathological bifurcation need to be educated in such a way that upon graduating engineering school they take it as their vocation to transform engineering and society in such a way as to inspire others to want to remain within society, not to announce that they are dropping out.

But how do we get there? The answer does not only involve changing their minds, but also changing our practice.

3.1 Dialoguing with the Bifurquers: Some Midstream Modulations

If there is anything which best characterizes why the Bifurquers performance seems infelicitous is the knowledge, gained with maturity, that there are rarely magic solutions. In consequence, we ourselves will not attempt to propose any magic solution to this problem. But we have some modest ideas regarding the kinds of teaching which might be relevant. We call it the planetary humanities, but this is a fancy name for a very traditional thing. The planetary humanities are forms of traditional humanistic learning drawn from around the planet, with the inclusion of these multiple traditions not being justified on the grounds that engineers of the future need intercultural competencies to solve global problems (though they need those as well) but rather out of the acknowledgement that traditions have developed forms of wisdom that are helpful in coping with the challenges of being a human being in a challenging and changing world.

With regards to current SD curricula, we are proposing what RRI scholars call a mid-stream modulation. This a minor adjustment undertaken after an innovation has been launched. It a course correction, not a revolution or a bifurcation. One way of looking at pathological bifurcation is as an immature reaction to a very hard

problem itself generated by an immature curriculum. The planetary humanities, at least as we understand them, are a very mature tradition evolved to help human beings to learn how to act with moral maturity. This kind of education in virtues is transmitted cumulatively, it is part of both the explicit and the hidden curriculum, part of the total performance of education (Carr & Steutel, 2005). More to the point, we do not feel that there is any master discipline for transmitting virtues of character, but a myriad of ways towards the acquiring the key lessons. Nevertheless, to illustrate how traditional humanistic learning might sway the Bifurquers towards less pathological trajectories, we want to illustrate three virtues while drawing on different cultures.

These are:

- A. A Sense of Moral Complexity
- B. Dialogical Skills
- C. Gaining Perspective

When the proper dispositions are acquired each of these moral virtues can bring about a kind of bifurcation within the life of the learner, altering how they react to external stimuli in such a way as to make them more apt to contribute to social flourishing. These moments of self-discovery form part of the curriculum in the widest sense of the term, they are the events which drive the dynamics of ethical identity formation (Lemaître, 2007). An identity, professional or otherwise, is constituted of a constellation of values which that person upholds and expresses in their mode of life. There is thus a narrow connection between ethical and moral behavior and identity formation (Gerson & Neilson, 2014). Yet an identity is not merely a set of values, it is also a way of seeing the world, a way of interacting with things and others. There is no short way to moral identity formation, just as there is no straight path towards adulthood, in particular if we agree with philosopher Stanley Cavell that morality demands an ongoing perfectionist commitment to self-education, or what he calls “growing up” (1999, p. 124) even among adults. It is in this commitment to perfectionism, which is also a commitment to learning from other cultures, that we discover humanism’s

evolved responses to tragedies and cognitive dissonances (Wulf, 2022).

3.2 Tolerating Moral complexity

One of the experiences most characteristic of the tragic, whether we are talking about drama or about our planetary condition, is what Reiner Schürmann has called the “double bind” (2017). This is an experience of moral complexity in which one finds oneself tied to double and contradictory moral allegiances. The monstrous flaw of the tragic hero is a refusal to acknowledge and submit to this fundamental complexity of human moral experience. One way of helping students to see that at times the only right way out is staying with the trouble is obviously through the reading of classical tragedy. But another and more pertinent way might be by returning to the origins of sustainable development itself.

As we have seen, many Bifurquers are critical of sustainable development. Thus we counsel reading and discussing the opening pages of *Our Common Future*, the first UN report on Sustainable Development, making a serious effort to reconstitute the geopolitical context, the then-contemporary understanding of what were called “global problems” (Mazlish, 2006), while summoning up some of the sharpest and most coherent contemporary critiques. We might start, for example, with these lines:

We can move information and goods faster around the globe than ever before; we can produce more food and more goods with less investment of resources; our technology and science gives us at least, the potential to look deeper into and better understand natural systems. From space, we can see and study the Earth as an organism whose health depends on the health of all its parts. We have the power to reconcile human affairs with natural laws and to thrive in the process. In this our cultural and spiritual heritages can reinforce our economic interests and survival imperatives. This Commission believes

that people can build a future that is more prosperous, more just, and more secure (Brundtland, 1987, p. 11).

As critics have suggested, this document is a product of compromises, and can even be understood to be part of a neo-colonial politics of domination (Ziai, 2015). This is clear in the cited lines reference to space, which reminds us of the ongoing and critical employment of satellites to observe the planet (Eyres, 2017). We can see that the pursuit of development involved and reinforced technology-generated power asymmetries associated with satellitization. It granted power to those nations which were capable of autonomously studying the planet from space, and created dependencies among those which were not. No one could claim that this element of asymmetry does not raise ethical questions. One can show that pursuing sustainable development collectively has given certain advanced nations a form of neo-colonial power over others (Tabas, 2024). Yet despite these very legitimate critiques—and any other critiques that the students are able to raise—we should ask them whether embracing *Our Common Future*, or any of the subsequent UN development projects—were concretely missteps. We might challenge them to place themselves in the shoes of other actors. We might ask them to propose an alternative. We might ask them whether they believe that refusing to sign the document in the hope that this gesture will bring out an egalitarian revolution in planetary power relations seems a reasonable strategy. In general, the aim of this exercise is to help them to appreciate the complexity of the decisions leading to the embrace of sustainable development.

The aim of this exercise is not to convince the students the current SDGs are ideal, only to help them to acquire a certain appreciation of the tragic complexity of certain moral decisions, the way in which they force us to humbly bow to realism and even pragmatism given the fundamental uncertainties which are in play.

3.3 Rules for Conversation

Thoreau may appear a role model for many who advocate for bifurcation. Yet those who fall into pathological bifurcation must read him selectively. Of the opening pages of *Walden*, they retain the first words: “When I wrote the following pages, or rather the bulk of them, I lived alone, in the woods, a mile from any neighbor, in a house which I had built myself, on the shore of Walden Pond, in Concord, Massachusetts, and earned my living by the labor of my hands only”. But they ignore the rest of the paragraph: “I lived there two years and two months. At present I am a sojourner in civilized life again”(2009, p. 1). His bifurcation, the effort which he made to step outside of cultural norms, cultivated a return, the product of which was a book, a fruit of his labors—so says Stanley Cavell—which “means in every word it says”(1992, p. 4). Thoreau thus ought to be understood not illustrating that one ought to cut oneself off from others, but only to show that such a strategy can help one to best perfect a form of communication which reaches others.

That said, the lesson which we would prefer to propose regarding communication does not come from Thoreau but from classical Indian political philosophy. As the great political philosopher and economist Amartya Sen (2013) has shown, India has a long and rich culture focused on the art of cultivating fruitful dialogue between groups with otherwise strongly opposed sets of values. Unlike in the West, where philosophical argumentation has generally taken the form of disputations aimed at achieving victory, Indian approaches to dialogue and discussion are structured around the goal of fostering harmony in the pursuit of collective justice.

Sen illustrates this approach to argumentation, as well as offers insight into the means employed to transmitting these ideas, by citing the *Bhagavad Gītā*. Like the Bifurquers who hesitate to participate in engineering because they see the potential ills that can come of it, Arunja in the *Gītā*, hesitates on the eve of a battle, expressing ethical objections to the war:

“O Krishna, I see my own relations here anxious to fight, and my limbs grow weak; my mouth is dry, my body shakes, and

my hair is standing on end. My skin burns, and the bow Gandiva has slipped from my hand. I am unable to stand; my mind seems to be whirling. These signs bode evil for us. I do not see that any good can come from killing our relations in battle. O Krishna, I have no desire for victory, or for a kingdom or pleasures" (*The Bhagavad Gita*, 2007, p. 80)

In the end, and after a long and respectful dialogue weighting of the options, Arunja accepts Krishna's arguments that it is his duty to go to war. While that conclusion might seem the point of introducing students to the text, Sen rightfully lays emphasis upon the fact that all of the arguments for and against are carefully presented and preserved, making the dramatization of the practice of argumentation as important as the ultimate conclusion pointed to in the narrative. As Sen helpfully puts it: "We have to take note not only of the opinions that won – or allegedly won – in the debates, but also of the other points of view that were presented and are recorded or remembered. A defeated argument that refuses to be obliterated can remain very alive" (2013, p. 6). It is exposure to this tradition of teaching learners not only how to argue, but how to deal with disagreements gracefully, which we think could aid the Bifurquers.

3.4 Gaining Perspective

The difference between pathological and beneficial bifurcation comes down to developing an ability to not only regard others with critical distance, but also to return from that point of exteriority towards a state of empathy. The Bifurquers attest to a loss of sense regarding the profession of engineering, they cannot find a perspective from which one could be an engineer within existing society. Yet we think that this is a failure of perspective, a lack of a planetary as opposed to a global point of view. As historian Dipesh Chakrabarty (2023) has emphasized, our planet is made up of many worlds, many different ways of understanding our crisis, while the global viewpoint assumes that there is only one proper way of looking at things. Developing an appreciation for how conditions can look differently elsewhere can help students to think outside what

might seem like a hopeless box, helping them too imagine ways of investing their energy elsewhere and otherwise. One means of doing this for engineering students in highly developed nations such as France is to put them into dialogue with students in developing nations. To illustrate what might happen if this occurred, we want to cite field notes taken by Linda Gardelle as part of research which she undertook regarding the implantation of SD education in the Maghreb (Amdouni et al., 2022). These notes bear on student and teacher perceptions of development and their role therein.

One notes right away the difference between the attitudes of this Tunisian student and the acute feeling of disenchantment that moves the Bifurquers:

Unfortunately, there is a lack of practice here in Tunisia, not all industries respect the environment. [Our teachers] prepared us for working life so that later if we work in an industry we will make a change. Even if it is not a “green” company, we will try to propose norms, to put into practice norms, or to open things up, with the idea that being green can help open other markets.

Is this just blind optimism or a naïve embrace of greenwashing? So it would seem if through the lens of the critical discourse of the Bifurquers. Yet we suspect that an extended encounter with these students during a voyage in Tunisia, or merely a deep ethnological dive into cultural values other than those which dominate in France, might change the potential Bifurquer’s opinions. After all, one of the reasons why the planetary perspective differs from the global perspective comes down to the fact that the planet does not appear to be the same everywhere. For example, while critics in wealthier parts of the world often believe our environmental destructiveness comes from the habit of seeing our environment as a resource to be exploited, they don’t tend to appreciate the good that can come of the still relatively sober ambitions of harnessing the power of nature elsewhere. Consider the development ambitions voiced by this teacher from Tunisia:

In Tunisia, we don't have water resources, we can't have the energy of the rivers, but we have the sun...We have this, this, this and this, we must use it. We must make people who live in the South aware...that they have the possibility of using solar energy to heat the water and even to light up their home.

It strikes us that most Bifurquers, happy to endorse the argument that technological development only contributes to the fabrication of “artificial needs” (Keucheyan, 2019), don't have hot water and electric light in mind, indeed they probably do not even realize that there are locations on the planet without access to these wholly artificial, yet nevertheless meaningful technological innovations. This absence of perspective precisely explains their lack of appreciation for the project of sustainable development.

Our contention is that by emphasizing that sustainable development pedagogy is not only about reconnecting with and learning to value nature (Kleespies & Dierkes, 2023), but also about coming to a richer understanding of the complexity of the human relationship to other humans, as well as to artificialization around the world, we can keep Bifurquers from bifurcating pathologically by showing them that engineering can still make sense. More to the point, we think that encounters such as this one can not only help students to reconciling themselves with remaining within engineering, it can also help them to discover avenues for practicing engineering in such a way as to really make a difference.

4. Conclusion

We have been attempting to explore the significance of pathological bifurcation for evaluating the current state of the transition towards greater sustainability within engineering curricula. It is our contention that while a certain number of reforms aimed at introducing new competencies are desirable, certain longstanding virtues and values, particularly those related with moral character and especially those related to the control of emotions and interactions with others, may need additional emphasis. Though we have presented

and explained the relevance of a few specific examples, it is a general commitment to humanistic education, including diverse perspectives from around the planet, and inculcated throughout a student careers, even over the course of advanced professional degrees such as engineering, which is necessary. We feel these relatively conservative reforms will not only help us better respond to bifurcation, but also help our students to discover new avenues towards promoting sustainability.

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