A Systems View of Classrooms

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Upon first reading, I found "The Air Conditions of Philosophy of Education: Toward a Microsphereology of the Classroom" somewhat inscrutable. It brings together a number of disparate sources, none of which I am familiar with. And it uses some new words in some new ways that challenge concrete, realistic, and pragmatic tendencies. But as I reread the essay several times, I had further insights. I began to enlarge my understanding of the concepts of "sphere" and "air" as metaphors. This freed my mind to consider the rich imagery of the essay. I even began to see how the essay fits within the work I have been doing on systems theory. Once I made that connection, the essay was able to "contain" me in its sphere, and I to "contain" it. I was not familiar with Peter Sloterdijk's work before reading this essay, but I find his effort to create a grand narrative using the ontology of spheres to be audacious and fascinating.

Physical Spheres

Spheres are important shapes. A sphere is the most resilient of all regular solids. Spheres bounce back; they are flexible. They are protective of their interiors. In a way, spheres are magical.

Spheres contain something. They enclose regions of space-time. Within those regions, magical things can happen. Spheres create a boundary, barrier, or membrane between what's inside and what's outside, thus allowing certain processes to occur that wouldn't otherwise be possible.

Consider spheres in the physical world. Spheres form spontaneously in certain solutions, such as those that contain molecules that are differentially attracted to various components of the solution. This process is fundamental to how many scientists think life began.[1]

Picture a bowl full of water. Add a teaspoon of oil. The oil disperses itself over the surface of the water, creating sheen on the surface. The reason is that the oil is lighter than the water and doesn't dissolve in it. Oil and water don't mix because water can't "grab a hold" of oil, because oil molecules have no end which is obviously positive or negative. The water (H-O-H) forms a kind of triangle in which the oxygen atom is at one vertex, and the two hydrogen atoms are at the other two vertices. The oxygen vertex tends to be negatively charged; while the other vertices are positively charged. When a molecule with clearly positive and negative ends (like table salt, or NaCl) finds itself surrounded by water, the water molecules pull the other apart — dissolving it.

To get the oil to dissolve, we need to add a special kind of molecule that is attracted to the water at one end and to the oil at the other. Such a molecule is a kind of soap. Think of dishwashing liquid. Put a drop into the oil and water. Immediately, the soap molecules arrange themselves into spheres, with oil globules in the interior

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of the spheres and water on the outside. Because the outside surface of the sphere is dissolvable in water, the soap disguises the oil — technically, it "soponifies" it — and makes it dissolvable in water. A globule of oil is surrounded by soap molecules which naturally arrange themselves into a sphere.

A similar thing occurs in one-celled organisms. The cell membrane is made up of molecules that are oriented toward keeping certain things out and keeping certain things in. Because the cell is alive, it must both expel waste products and bring in raw materials and energy. The cell membrane allows for this interchange to occur in a way that preserves the integrity of the cell.

Each of us starts life as a single cell: a fertilized egg. Even though in our adult forms we have trillions of cells, that one initial cell builds a series of new, larger boundaries as it develops, keeping our insides separate from, and protected from, the outside while allowing waste products out and raw materials and energy in. In this way, *we* are spheres — not so much in topological form, but in function.

Functional (or Metaphorical) Spheres

A one-on-one human encounter forms a sphere in the sense that the interaction between two subjects creates a kind of protective boundary around it, keeping outside distractions at bay while enabling further intimacy "within" the sphere. Think about an intense conversation with a longtime friend or a new love interest. This can take place within a crowded external environment, which recedes into the background for the two people engaged in the conversation. But as Sharon Todd and others have pointed out, even this kind of intimate encounter can be seen in terms of otherness, or even violence. Spheres can contain highly reactive combinations of entities as well as those that seem to just get along.

We can extend this notion of a "boundary" that forms between an interior (which may include one or more subjects) and an environment to the formation of any social group, for any amount of time. Ford describes a class of students in terms of the formation of spheres. I love the image of a succession of such spheres forming within a physical classroom over the course of a day or multiple years. The physical classroom is a sphere that enables for formation within it of temporary spheres. Each of these temporary spheres contains a different ecology.

Ford's discussion of bubbles as a particular type of sphere is especially fascinating. Physical bubbles form into perfect spheres (instead of any other shape they might have originally formed as) due to a natural redistribution of pressure and tensions such that the surface becomes uniform. In a wonderful phrase quoted from Sloterdijk, bubbles "live towards their bursting."[2] This is why Ford refers to the formation of classes in classrooms in terms of bubbles. They are temporary, like all human encounters. Classrooms are themselves contained within larger spheres — some physical, some metaphorical — such as schools, districts and communities. Each of these spheres affords some enablement of functions within and protection from forces without.

If we can appreciate the concept of sphere in its metaphorical aspect, I think it's fair to say that all spheres are systems: "A system is an arrangement of entities

and their *interrelationships* such that there are some regularities or interactions in the ways that the entities behave and such that a *boundary* can be defined between what is considered inside the system and what is considered outside the system (that is, in its environment)."[3] I venture to say that this is what Sloterdijk and Ford mean by a "sphere." But now let's turn our attention to air.

Air

I thoroughly agree with Ford that air is an undertheorized aspect of classrooms and of human experience more generally. Air is easily ignored in favor of more concrete or visible aspects of our environments. Yet air is — without a doubt — an absolutely essential ingredient in human life. It does at least the three things that Ford mentions: (1) it is a foundational element of life and thought; (2) it incorporates social change and presses in on us; and (3) it communicates affective states in classrooms and elsewhere.

There simply is no life without air. Without air, comes death. If a human being were suddenly exposed to the vacuum of outer space, the person would literally explode because we are constructed in an environment where, at sea level, 14.7 pounds of pressure are exerted on every square inch of us. Air keeps us together and provides essential ingredients (especially oxygen) that fuel us.

Air also connects us to others in all sorts of ways. While — contra Irigaray — air is not necessary for the transmission of light, air does allow the sun to create the day. It's always dark on the moon, even when the sun is shining, because there is no air to diffuse the sunlight and light up the whole sky with blue, as there is on our magical Earth. Air *is* transparent, so in that sense it does transmit the light rather than blocking it or reflecting it completely. What's more, air provides the medium by which both sound and smell are transmitted. Sound is literally a wave of energy within the air. Indeed, it's helpful to remember that while sound waves can carry very subtle signals through the air, they can also — if they are loud enough — actually kill. (Talk about "fierce air"!) Smells and other compounds are transmitted by diffusion, moved around by random Brownian motion or pushed by the breezes. In terms of systems theory, and also semiotics, air is a medium for the transmission of *signals* of all types, including, as Ford reminds us, signals of affect.

One striking idea about the air as an ocean surrounding the earth (as its "atmos-sphere") is that this ocean is constantly absorbing new compounds and distributing them around the world. One blogger has estimated that in each breath we just took there are more than four trillion molecules that were at one time breathed by Jesus (assuming he lived and breathed like the rest of us). The air is quite literally a pneumatic commons, a breathed commons that unites us all. Consider also that each of us regenerates our own selves every sixty days (by replacing all of our atoms with other atoms) — many of those atoms coming from the air. The air is a solution in which many different compounds are dissolved.

Conclusion

To conclude, I want to go back to understanding the classroom, or a particular class of students, as a bubble. What are the bubbles made of? There's no soapy water

dispensed by a magic wand and filled with air from the breath of a childlike being. But there is a kind of magic that forms classes. There are complex systems of sorting and allocation at work in forming each class. Serendipity is part of it, but of course there are other forces at work, too. It's all incredibly complex.

But stepping back a bit from the actual mechanisms of class formation, once a given class is formed, the bubble containing it is made up of relations among the participants. Relations constitute all systems. Relations are invisible, like air, and yet they are perhaps the most significant aspect of the classroom. Brent Davis and Dennis Sumara, among others, have written about the complexity of these relations and the way that humans can contain one another, or aspects of others, such as their ideas.[4]

Air fills the bubble of the classroom. The transmission of ideas from one person to another — a form of signaling between and among complex systems — takes place through air. These ideas don't just travel *through* the air — they affect it, in the sense of the atmosphere of the classroom. Enthusiasm for learning is contagious, like a disease: it also spreads through the air of the classroom. If we think of a classroom atmosphere simplistically in terms of the temperature of the air, teaching can be seen as a kind of temperature regulation. Traditional teaching by lecture fills the classroom bubble with the teacher's hot air. More dialogic teaching that involves more give and take heats up the air by dialogue. This heat can occasionally expand the bubble to the point of bursting, and teachers have to cool things down for a while. Other times, there is a kind of "dead air" in the classroom: the air loses energy as it cools and begins shrink, and sometimes the bubble goes flat.

There is so much more we can explore using this metaphor, or similar ones involving air, and bubbles, and spheres. This fecundity is a sure sign that Ford has "gestured toward" some interesting philosophical possibilities. I urge him to take this further.

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1. Fritjof Capra and Pier Luigi Luisi, *The Systems View of Life*: *A Unifying Vision* (Cambridge: Cambridge University Press, 2014).

2. Peter Sloterdijk, *Spheres I: Bubbles: Microspherology*, trans. Weiland Hoban (Los Angeles: Semiotext(e), 2013), 64.

3. Craig A. Cunningham, *Systems Theory for Pragmatic Schooling: Towards Principles of Democratic Education* (New York: Palgrave, 2014), xx.

4. Brent Davis and Dennis Sumara, *Complexity and Education: Inquiries into Learning, Teaching, and Research* (Mahwah, NJ: Lawrence Erlbaum Associates, 2006).