The history of science we’ve presented until now can be viewed in critical retrospect as far too narrow and focused on a very thin, singular line of development: on primarily physics and astronomy in how they’ve transformed from “the Scientific Revolution” – Copernicus to Kepler to Galileo to Newton – thru dramatic transformations in late 19th century that overthrow the “classical Newtonian paradigm” and set up Einstein et. al., leading to quantum mechanics of today.

That is, in terms of the development of our contemporary Western worldview, this is an extremely important line of development, but we need to cast a much broader net to capture many more such “lines” of development and make our historical understanding much thicker, weaving these lines through each other to make a broadcloth.

The first intimation of this broader history was set up a couple of weeks ago: in arguing that the Scientific Revolution and ensuing Enlightenment period was momentous, but only for the privileged educated upper class gentlemen of leisure of western Europe. I.e. momentous for a small elite. Since this small elite have tremendous power, the momentousness extends beyond this small elite circle. But still, the bulk of its momentousness is centered within this small elite circle. Thus, when the Scientific Revolution truly becomes revolutionary, and the Enlightenment truly spreads into effecting “the people”, is due to the advent of universal education in mid to late 1800s, spinning off from the change in the university from traditional transmission-of-tradition through teaching to modern research in 1810 University of Berlin, late 1870s on in USA.

So let’s try to understand this momentous shift better and more thickly/broadly/multiply, in terms of hierarchy and isms. Why? B/c, in short: medieval Christian theological worldview was highly hierarchical; modernity revolts and rejects, and through science, proposes a number of isms that flatten out the hierarchy; post-modern last decades, is a reaction against the flatness and reintroduction of hierarchies.

First: broader historical context than history of physics: a series of convulsions, seizures, moulting, paroxysms, earthquakes or tremors…

1400s Renaissance: a rebirth of culture in retrieving of Greek classical works

 -challenges traditional Church authority in context of high culture

1500s Reformation: a reform of religion through reform of the church in retrieving of Scripture as directly accessible to believer

 -challenges traditional Church authority of Pope and hierarchy in context of church; new doctrines for Protestants

1600s Scientific Revolution: a revolution in natural philosophy, changing cosmology

 -challenges traditional Church authority “natural theology”, phil

1700s Enlightenment: takes the lattermost and **proposes** this revolution needs to extend far beyond natural philosophy – or, natural philosophy extends far further into everything than we realized – into every sphere of life

 -this **proposal** challenges ALL of traditional Church authority in everything

 -at its most radical, rejects church, religion, Christianity altogether

All of the above shake the traditional medieval Christian theological world**view**. None of them undo it! Why not? Because the traditional medieval Christian **way of life & practice** for the majority of the people remain the same. Social and economic class structures; political structures of authority; educational practices; mostly rural/agrarian populace; Church attendance, etc., all continued more or less as before.

1776 American revolution. 1789 French Revolution, often seen as the “fulfillment” of the Enlightenment (i.e. a society based on Reason); these revolutionary ideas spread out to rest of West

-political revolutions: democracy and end of monarchy and ideological assault on class structure

1780-1830 Industrial Revolution in Britain, from where it spreads out to rest of West

-social and economic revolution: transformation in basis of life, development of factories and industries and transition of economic base from agriculture; dramatic convulsing of class structure, increase of disparities, creation of a middle class; massive urbanization

1810 Educational reform in Germany; which becomes a major spur to universal education, to rest of West in all western countries by end of century (to rest of world by mid-20th century)

-cultural revolution: from early on, all students gaining literacy and education (greatly increasing pool of “critical thinking” and questioning) and suddenly the Scientific Revolution goes from an elite to mainstream: from the preserve of elites with some influence, to becoming common property of the masses

-this cultural-educational revolution runs alongside all the other political, social, economic, changes: the change in the living base of practice, means the Enlightenment’s idea of revolution in worldview finds a receptive base

Thus, the Enlightenment version of science: a dramatic levelling of traditional hierarchy of Church’s medieval theological worldview, in exchange for deep space (astronomy & physics), deep time (geology), and deep process (evolution); represented above all by movements like naturalism, empiricism, and then positivism (each as philosophies of science), and by a new discourse centered on objectivity: mechanism, mathematics, and some kind of “measurability”, whether observable, quantifiable, technologically accessible or manipulable, all seem to capture what is key in the new science. What comes along with this new objectivity is also a transformation in the subject: as a rational mind studying nature, using his senses and instruments in a methodical way, as a free consciousness questioning and investigating the field of nature laid out before him; i.e. a S-O version of reality becomes firmly ensconced.

This, runs alongside a dramatic transformation in social life, that largely levels many of the old hierarchies and opens up social, economic, political, and urban life, such that people for lived practical social reasons, are open to the radical Enlightenment challenge to the traditional medieval theological worldview.

The basis for this challenge is the deep space deep time deep process conception of Nature. Alongside this one-dimensional reality view of Nature, is a massive reduction: human nature in all its variety, cultural, emotional, political, psychological, etc., is reducible to nature; the supernatural is reducible to some human psychological state (projection, false consciousness, ideology, etc.). Of all the theories of the sciences, positivism represents this reductive levelling and flattening most strongly: only science gives us positive knowledge. All other knowledges reducible to science. Anything else is metaphysics and unknowable and should be thrown out. Comte proposes a history divided into 3 periods: theology followed by metaphysics followed by science (or myth & religion, then philosophy, now science). He also provides a new kind of hierarchy: mathematics > astronomy > physics > chemistry > biology > sociology. This is not a hierarchy of reality, like the Great Chain of Being or scala natura. It is not ontological. It is epistemological and pragmatic, in terms of how to situate scientific theorizing at different levels, but these levels are all reducible to one level, Nature.

To the logic of deduction (general to particular) and induction (particulars to general) can be added reduction: explanation of outward appearances and diversity in terms of an underlying causal mechanism running by natural laws.

This is the context of late 1800s (prior to physics revolution). This sets scene for development of our modern university, and the model/paradigm for all wannabe sciences to imitate. (e.g. psychology, language of mechanism). And, a radical rejection of religion in those decades (conflict thesis btwn science & religion). And with export of universal education and university system throughout world, we see this worldview change happening: Frank & Gabler, 2006, tables. Explosion of social sciences.

Of course, this history is still way too thin. I’ve focused on what is the “spine of power” running from Enlightenment thru 19th century into 20th, but still too narrow and thin. One important strand I’ve left out: there is resistance and disagreement from the beginning. Against Enlightenment empiricism, is rationalism; against Enlightenment as a whole, is Romanticism (in literature especially); against positivism, is idealism; against the enormous power of Enlightenment-derived positivism-empiricism-naturalism and the natural sciences, is 19th century existentialism, philosophies of the will, the “human sciences” movement, followed by phenomenology and hermeneutics. A figure like Descartes, who is both empiricist scientist and rationalist philosopher, is important during the Scientific Revolution. Thus a figure like Kant is hugely important, as someone who stands in the middle of/at the end of, the Enlightenment, and who articulates a way past the empiricism/rationalism debate that ends in a skeptical/dogmatic dilemma. And, a broad “cut” in philosophy emerges: between an Anglo-American philosophical tradition that sees its role as acceding to science and being its “underlabourer”, and a Continental philosophy tradition that sees its role as being to undercut, or overarch, or circumvent, or articulate alongside or beside or behind, science; or in large part defend the non-scientific from its being reduced by science.

So one way to move within all of this: forward, within the AngloAmerican tradition, to where the flattening power of science thru positivism starts to fall apart. (This is Kuhn. The next stage, post-Kuhn, will be new studies of science – sociological, historical, gendered, psychological, anthropological – in place of old philosophies of science. Another stage: would be to update and sophisticate old philosophies of science into newer forms – like critical realism.)

Another way to move: backward or sideways, into the Continental tradition, to retrieve powerful theories that still hold critical power today. Or to build on them into alternative movements of thought. To return to the notion of science and life, and their relation, becomes a question of how one languages and understands these different domains. For example: science & religion have complex relations (Barbour’s 4; Gould’s NOMA). That NEP dominates in late 1800s, means a conflict model dominates the educated imagination, mass media imagination, popular culture imagination.

Regardless of which way one moves, there is the question of how to relate all these different fields/sciences/scholarships, what is their status relative to traditional science, etc..