

Outline

principles (buildup of examples)

- Kuhnian problems (normal science revolutions in comm. sci. 1974)  
 Quinean problem - holism - attack on grounds required for idea of 'constitutive priori' in Group  
 motivation / inspiration from Kuhn & Quine

- Friedman's conception of constitutive 'priori' / coordinative principles  
 → Newton's Law as example of both: fundamental asymmetry in methodology, theoretical & epist. roles of priors serves idea of constitutive 'priori'. Quine's 'entire ment' is irrelevant.

- "body"  $\approx$  has mass, acceleration, velocity, spatial position  
 - rule for giving phys. systems to math.  $\times$  form of  
 Euc. geom (points in Euc. geom = spatial position, words = phys. paths, lengths = velocity, etc.)

- successive approx. of constitutive priors in revolutionary transformations a prod. of rationality  
 - communicative vs instrumental reasons

-  $\Phi$  as provider of meta-fun to provide criteria of rationality, reasonability of fun  
 → possibly by providing a ground for "weaker" form of communicative rationality,  $\Phi$  & debates provide shared language w/in and competing sides can understand each other, agree on some rules of the game, even if they can't come to stable, complete agreement

→ Kuhnian picture of sci, normal vs revolutionary (Friedman's use of Holton's) address the prod. of trans. revolution rationality  
 2 kinds of rationality to (in part)

Probs for Friedman: is the weak form of "communicative rationality"  $\Phi$  can provide during revolutionary periods sufficient to fully drive off the worries about rationality and anti-rationalism? can mutual understanding (possibility threat) by itself do so, if one cannot advert to a shared ground in real empirical facts as well? Here, I think, Friedman will want to point out that there are shared empirical facts in competing funs [read Russell's characterization of objectivity & shared descriptions of Group's ground for epistemic what in shared understandings of common language]

Theoretical problems for Friedman

- 1) Kuhnian revs / incommensurability / rationality of theory choice
- 2) how theory acquire empirical content
- 2.5) Quine holism: attack a rationalized a priori

Sketch of Kant [see notes from 'P sci of Kant', 22 Oct 2014 and 12 Nov 2014]

- $\Phi$  grounds sci's knowledge: explanation of necessary preconditions of <sup>in full Kantian sense</sup> experiential that makes theory, experimentation, and there fruitful combination possible
- Kant assumes we have fully reliable, warranted sci knowledge
- question is, in face of human skepticism about synthetic a priori judgments, how is this possible?
- N.B.: Kant wants completely secure, unassailable, warranted sci knowledge, an assumption that Newtonian theory is the final, best theory! [contra, e.g., Newton himself]
- Synthetic judgments: not analytic, not true formally in virtue of structure of concepts
- a priori judgments: necessary and not grounded in experience and "constitutive of object of knowledge"

⇓ anatomy of scientific theories: a priori / constitutive <sup>vs</sup> empirical laws - the former provide the ground for what we would call today the semantics of the latter; the semantics of the former themselves are fixed 'transcendentally'

Friedman

Fundamental claim: Pol discussions, argument, investigation (by providing a new framework of the restructured a priori)

both make possible scientific revolutions and at the same time provide epistemic warrant for providing grounds (objective, reasonable) for choosing the new theory as superior (contra Kuhn), and does so by the difference in epistemic / semantic / structural roles played by diff't parts of "theory", viz, constitutive a priori and empirical laws (contra Quine holism, injection of analytic / synthetic distinction)

→ quote p. 23: "Science, if it is to continue to progress -"

Fundamental problem: articulate sense of "constitutive a priori", diff't from Kant's (which we know how can't work), that can do the job

⇒ Reichenbach & Carnap to the rescue!

withi network between formal, abstract rep and concrete experiences  
↑  
makes testing of empirical laws possible

→ relativized and dynamical conception of 'a priori', as "constitutive of object" (Reichenbach) and articulating grounds the idea of 'possibility' relevant to investigation using / based on a theory (Carnap's Frameworks), viz, "constitutive of correctness of reasoning"

→ note, this is not the sense 'possible' as in "what might be" but rather "given my conception of how the theory tells me how the world may be and what are acceptable ways of investigating it, what are the real possibilities for what I may find? (and so, correlatively, what will count as contravening evidence against my theory?)"

Contra Quine

- development of Newton's theory in which a new mathematics (calculus), a new physical framework (Newtonian mechanics: laws of motion, defns), and new empirical laws (gravitation) were developed ~~and so~~ en bloc and sep mutually supported each other seems prime facie to support Quine holism

but - closer examination shows they play very diff<sup>r</sup> epistemic/semantic/structural roles  $\Rightarrow$  Structure of theories:

[see lecture notes 'Phi Sci of Kant', 05 Jan 2015, p.1]

- ① calculus <sup>and Euclidean geometry</sup> provides fw (meaning, standards of formal correctness) for formulation of (e.g., 2<sup>nd</sup> Law)
- ② 2<sup>nd</sup> Law: constitutive of notion of "physical system"; defines "inertial motion" (constitutive of notion of "free dynamical evolution")
- ③ law of gravity: empirical law, requires 2<sup>nd</sup> Law for meaningfulness (what counts as mass, what counts as acceleration)  $\Rightarrow$  each of former can be "true" while latter is false

$\Rightarrow$  ① & ② are "a priori" in deep sense! [in the context of the theory]

$\Rightarrow$  GR is similar

- ① tensor calculus, Riemannian geometry
  - ② Einstein's principle of equivalence (defines 'inertial' & 'gravitation', gives standard/meaning of 'acceleration')
  - ③ Einstein field equation: "variably curved spacetime" has no empirical meaning without principle of equivalence telling us what a geodesic is, and so gives content to rel<sup>n</sup> of how matter/stress-energy is correlated with curvature of spacetime
- $\Rightarrow$  each of former can be true while latter is false

PICK UP HERE ON THURS

Contra Kuhn: radical revolutions in maths and mathematical physics are not characterized by incommensurability, entrenchment and relative resistance, what distinguishes them is their constitutive function in the context of character of our scientific knowledge, theories of experiments and how they hook up to each other

$\Rightarrow$  3 distinctive parts/phases of sci <sup>development of</sup> (contra Kuhn)

- ① normal sci
- ② revolutionary sci
- ③ post-articulation of "meta-facts" within which revolutionary sci can operate in principled way

⇒ these not distinguished by differences in epistemic warrant/  
security, but by differing functions/roles in the structure of  
our scientific knowledge, both in normal science and during  
times of revolutionary upheaval



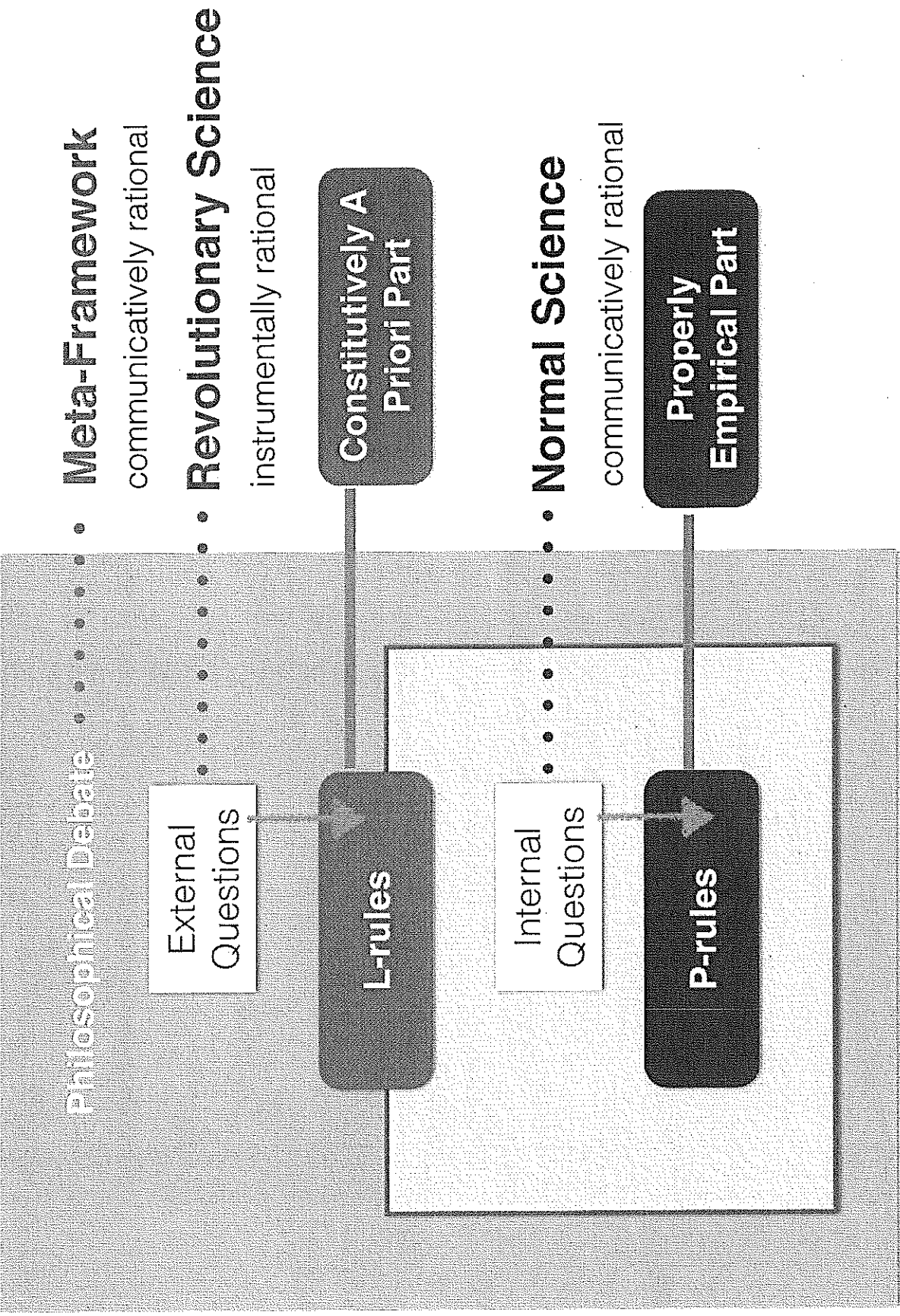
read quote on p.46, my quotes in marginal notes, <sup>about constitutive - prior as a framework</sup> and  
p.48, my quotes about impossibility of <sup>these</sup> 'universal human  
rationality'

① in revolution, only "rules governing investigation of one part of nature"  
must be given up, not all "rules of rationality" pertaining to all  
kinds of investigation

② ∃ can still "overarching rules", such as general idea of  
physical experimentation and data-gathering (and this will be  
"local knowledge" in only a trivial, shallow, irrelevant sense)

### Instrumental vs Communitarian rationality

- 1) Instrumental: goal-oriented means and aimed at maximizing chance of  
success in pursuing goal, is subjective - revolutionary science
- 2) Communitarian: argumentative deliberation aimed at agreement of  
consensus of opinion based on shared principles. [Russell's  
"objectivity" is shared descriptions; Compton's basis for epistemic warrant  
in shared meaning among users of common, simple language]  
⇒ normal science is not developing "meta-frameworks"



Philosophical Debate

External Questions

L-rules

Constitutively A Priori Part

Internal Questions

P-rules

Properly Empirical Part

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**Meta-Framework**

communicatively rational

**Revolutionary Science**

instrumentally rational

**Normal Science**

communicatively rational