- ontology, methodology, epist'y, & rel'ns among them (distinguish, discuss → he's interested in 1st & 2; 2nd he assumes will be justified, underwritten by meth'y)
- model vs realization vs set-theoretic predicate
- example of set-theoretic model of something simple (his Newt'n classical particles) - not exactly his set-theoretic predicate, but close enough for our purposes
- levels (hierarchy) of model (theory, data) and so diff't 'theories' (e.g., that of exp'al practice/procedure/technique, &, so as to construct formal model of data → model of experimental outcome) → characterize possible outcomes
- emphasis on probability of statistics - real connection between theory & exp - grounds epist'y (mention Reichenbach en passant)
- 'model' as unifier of scientific knowledge (in all senses of Stein) across disciplines: the heart of soul of science
- 'theory' as linguistic entity vs a set of models - why he prefers the latter, but does not reject the former
- connection between axiom system as linguistic model and as set-theor structure - why he thinks latter solves the linguistic problem; and why former is still required to construct the latter, and possible probs this may cause him
- relations among levels of hierarchy of models: 1) morphism; 2) substructure/embedding; 3) construction of new structure (tuples for exp'l runs)

Suppes Lecture, Sems/Struct Theors

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①

"Meanings & Uses of Models in Emp Sci" & "Models of Data"

Setting the stage: comparison w/ Log Emp

- explain ontology, epist, methodology - Carnap focused on 2nd, Suppes on 1st & 3rd (see p.34 "Mods of Data") [→ rel'ns among them]
(aside - phil community's tendency to ignore what they have in common, rather focus on differences and criticism - Pat doesn't entirely do this, but to some degree)
[margin: especially wrt recognizing differences in motivations and assumptions and trying to accommodate them]
→ why? he assumes 2nd will be justified and characterized by good methodology; structure of science enforces constraints on good methodology ("Mods Data" p.33) but not epistemologically, and
→ observability is still important, but not epistemologically, and ontologically and methodologically: unobservables have no direct analogue in data models, so rel'n of them to theory models is delicate ("Mods of Data" p.25) ⊛ 'unobservability' means nothing having to do w/ epistemology in traditional sense, rather 'fictions' entities like center of mass that must be calculated from data (data are calculated from observation)

- possible realization vs model vs theory (explain (logical type))
- latter is linguistic (axiomatic), former non-linguistic ('ontological')
- characterized by models, which are objects of primary focus (~~i.e., physical models ... but for Suppes the logical structure~~)
and use, for methodological reasons
1) unify scientific knowledge: its character and justification: Carnapian explication: the meaning of theories & their terms
⇒ 'physical' models can still be models, but what is most important are the structures of the models (logical type)
not the 'entities' (his remarks on Maxwell's theory & his models of the ether) - structure remains
[margin: 'realization' is usual Tarski's possible realization is showing the explicit designation in all senses (Stan) and this is the rendering of the language's syntactic entities and how they map on to the domain and sets of sets from the domain; 'model' is a possible realization that can be put into rel'n w/ the linguistic entities 'model + a realization' in its modern sense - me]
- example of model/axiomatization of classical particle mechanics
P = {particles}, T = {elapsed times}, s = {position, domain = P×T}
m = {masses on P}, forces f = {P×T×ℕ} (ℕ for labels)
model: planets in solar system
⇒ 'constant interplay between' linguistic theory & non-ling models' (difference w/ later sems theory folks)
- the precision and clarity afforded can be used to address traditional phil problems (e.g., reduction); and to clarify 'conceptual character, goodness, etc., of theory

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- Uses in sci vs maths
  - some similar to uses in maths, e.g., the gen'l problems applications
    ⇒ clarifies, gives more exact understanding of ~~character~~ of theory
  - Gedanken experimente
    ⇒ precision & clarity allows for convincing extension of theory into previously unexplored domains
  - analysis of rel'n ~~between~~ among theory, experiment & data
    ⇒ rel'ns, comparisons among models of diff't logical types (contra maths) requires new tools for relating and comparing them, and justifications for goodness of those new tools
  - radically diff't kinds of models (continuous funcs vs discrete, finite data sets)
    ⇒ requires ~~severely~~ drastic assumptions & reduction "experimental experience" ("Meanings & Uses", p. 297) to a simple model comparable w/ those of theory

- hierarchy of models — his emphasis on nuts & bolts of exp, how to hook up to theory, very diff't from later sems view folks (e.g., VF)

  all diff't 'logical type' ⇒
  - theory
  - models of exp
  - models of data
  - experimental design
  - ceteris paribus conds

  } each of these has its own 'theory' – hence justification for speaking of models of them → methodologically strong assumption

start here 15 Dec — most important for our purposes are models of data – and here distinction between 'possible realization' and 'model' becomes most acute ('Meanings & Uses' p. 299)
  ⇒ must include ways to reflect how experiment was performed as ~~test on prediction~~ as guided and informed by theory – otherwise data is irrelevant to theory

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- exs of all these 'theories' and their models
  - 'ceteris paribus': no explicit rep in higher theories of hierarchy; must have good story to tell about why they are irrelevant or how they are controlled for
    ⇒ diff't from ways that other factors / entities / parameters don't enter at some levels of hierarchy

- 'exptl design': what is actually done, observations actually recorded, physical config
- 'data': transformation of actual observations into data that in principle can make contact w/ mathematically rich models of theory ("subject pressed red button at trial n" cannot — turning those obs into statistics can)
- 'models of exp': what is recorded and how transformed into data
- 'theory': what we normally think of as that

- special about data models
  → more structure than 'theory of exp', or, more accurately, structures "built up" from those of theory of exp ("Mods of Data" p. 28)
  – and still very abstract

⇒ see p. 31 of 'Mods of Data' for consequences of his view

~~observations~~ o
- theories do not predict observations or data — only in conjunction w/ theory of exp — see remarks on p. 32

⇒ "methodology" captured by, rep'd by, and helps guide proper interp and construction of, relations among the levels of the hierarchy

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Statistics

- what connects data models to experiment (see intro of prob measure as way to rule out all possible realizations as models) and so to theory
  - ⇒ where exp't may enter, or at least is strongly borne upon