

## Laws of “Nature” and Lawhood

- Since **Lecture III**, we have made reference to such a notion as “law.” More recently (recall **Lecture XIII**) we dealt with the subject (albeit) elliptically, viz. **scientific explanation**. (Recall Carnap’s criterion). The time has come to analyze this notion in greater detail. **As it turns out, such a concept like ‘law of nature,’ or ‘lawhood’ presents itself as deep chimera for philosophy of science, and philosophy in general: involving an interesting intersection of issues in metaphysics, logic, philosophy of language, and in epistemology.**<sup>1</sup>
- In broadly metaphysical terms, philosophical theories of law or **nomology**<sup>2</sup> distinguish themselves between **necessitarian** and **regularity theories**. Necessitarians argue that what underwrites nomology is its **universal** or therefore **necessary** character, whereas **regularity theorists** argue that there is nothing above and beyond **nomology** than *actual* regularities or patterns found in nature.<sup>3</sup> Both positions are fraught with their own distinctive difficulties (touching, for instance, on more general issues like *realism* versus *anti-realism*). Perhaps one simple way to distinguish the two positions is by way of the following analogy:

In the philosophy of space (and time) there are the *substantival* versus the *relational* metaphysical theories. *Substantivalists* argue that space (and/or space-time) is a *substance*, i.e., *an independently existing entity*. *Relationists*, on the other hand, argue the opposite: space-time is a purely *relational* property (between entities, events, etc.) To a substantivist, there can be such a thing as pure space-time, i.e. a universe without

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<sup>1</sup> Recall **Lecture I**.

<sup>2</sup> Which typically presuppose of course the notion of **natural** law, of obviously particular interest to philosophers of science, as opposed to **jurisprudence** (which is the philosophy of **legal systems**, i.e. human-made law), or **metaethical nomology** which investigates notions like **moral laws**. However, in many cases, philosophers of science puzzling over a concept like natural law may seek inspiration from philosophers writing about the notion in other research domains, like in ethics, politics, and in legal theory.

<sup>3</sup> A. J. Ayer (**CC1998**) makes oblique reference to the distinction in his discussion touching on issues of theology (808-809). Historically, **necessitarians** would fix their claims on lawhood as having some kind of a **transcendent** (i.e. going above and beyond what is **actually** the case) basis (whether divine or otherwise...non-theologically based notions for instance would include mathematical Platonism) whereas **regularity theorists** would argue the opposite (in an **immanent** notion). David Hume of course was a regularity theorist, who argued for instance *that there is no notion of empirical necessity* (the only kind of necessity is *deductive*) connecting, for instance, cause with effect (or vice versa). Causality, in other words, like *all natural law*, are derived from *actual regularities and patterns found in nature*. There is nothing more to the story, for Hume, else one could engage in armchair *a priori* reasoning and ‘discover’ contingent principles of nature. Ayer is likewise a regularity theorist, of a more sophisticated epistemic and logical variety. C.S Peirce was also a regularity theorist, who argued that physical laws, like organisms, can evolve in time. Dretske (not assigned in your readings) is on the other hand a necessitarian (drawing much inspiration from metaphysical and logical theories of *essentialism* developed by Saul Kripke and Hilary Putnam.)

particles or events. To a relationist, such a thing cannot be. In other words, the simplest universe would consist of at least two (particles, events) etc. To put it another way, (adopting a genealogy analogy here) a substantivist, if you will, would argue that ‘family tree’ structures can ‘exist’, *even with no members*. Relationists disagree: *there can be no family tree without actual offspring filling their ‘slots.’*

As you can tell from the above analogy, note the implied *realism/anti-realism* issue (concerning the *metaphysical* notion of **properties**.<sup>4</sup>) By the same token, necessitarians are like the substantivists, while regularity theorists are like the relationists:

According to the regularity theory, **the objective content of laws is exhausted by what actually happens in the world.** (CC1998, 880)

The universals theorist [on the other hand] that not only does the *FG-law* [i.e. laws characterized in terms of “all *F*s are *G*s”<sup>5</sup>] **logically imply that all *F*s are *G*, but also that the...law explains<sup>6</sup> the ‘mustness’ or necessity that we think holds between particular things that are instances of the law.** (887)

To give an example: Dretske the necessitarian adopts an **analogy** from jurisprudence: To preserve the *contingent* character of natural law<sup>7</sup> while at the same time get across this *necessitarian* sense:

There is a legal code in the United States that lays down what powers pertain to the office of the president, the two branches of Congress, and the Supreme Court. **The code itself is contingent: the constitution of the US could have been different. But given that Constitution, it is now true of anyone who holds the office of president...The law is not about the particular people who hold the various offices; the laws is about the powers and duties of the offices themselves and the relation between them...[B]ecause the law is what it is, anyone who holds a particular office *must* behave in a certain way.**<sup>8</sup> (889)

- The above mentioned metaphysical issue (regularity versus necessitarianism) gets cashed out in various epistemic, logical, and linguistic problems associated with the notion of law-hood. Consider the following problems (denoted by Bas van

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<sup>4</sup> we briefly visited some notions in the references to Michael Dummett, and Hilary Putnam, in our previous examinations of the question concerning scientific realism (**Lectures IX-XI**.)

<sup>5</sup> Stated more formally by Dretske: ‘*F*-ness’ → ‘*G*-ness’ where he ascribes some extra properties on “→” as essentially being a (logically) *extensional* relation among *intensional* predicates.

<sup>6</sup> As we have seen in the case of Boyd, etc., many philosophers of realist sympathies ultimately adopt an explanatory strategy known as *Inference to the Best Explanation: A theory that best explains the evidence (or at least explains it better than its known alternatives) is supposed to provide the most reasonable grounds for its assent, or at least make it more probable or reasonable to believe.* Contemporary necessitarians like Dretske adopt such a strategy.

<sup>7</sup> Recall **Lecture II**: A *contingent* statement is one which when negated won’t produce a contradiction.

<sup>8</sup> Obviously this is *analogy*, not an *argument*. Regularity theorists criticize it as question-begging.

Fraassen as the **identification** and **inference** problems, which is especially worrisome for the necessitarian.) The **identification** problem deals with how one may connect up specific instances of a law ('this *raven* is *black*') with universals like 'raven-ness,' 'blackness' in laws characterized in "all *Fs* are *Gs*" –form. This is obviously an instance of a more general metaphysical problem concerning the *problem of the ontological status of universals*.<sup>9</sup> The **inference problem** on the other hand touches on the logical distinction between *intension* and *extension*.<sup>10</sup> Consider for example the following *FG* law (an example discussed by Mellor<sup>11</sup>)

P1: "It is a natural law that all mammals have mammary glands."

P2: "It is a natural law that all mammals have hair nad vice versa." (I.e. the *intensions* 'hairy animals' and 'mammals' are *co-extensive*, or share the same extension).

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∴ All hairy animals have mammary glands

The above deduction of course follows straight from *Modus Ponens* and substitutivity.<sup>12</sup> **On the other hand, we'd be loath to conclude from the above that: "It is a natural law that all hairy animals have mammary glands."** What kind of *empirical connection*, causal mechanisms, etc., would connect such predicates? So however we make inferences in a way that's **nomologically preserving** (i.e. forming conclusions prefaced with 'it is a natural law that...') it seems to hinge on something stricter than just logical extension, i.e. has something to do with *intension*, perhaps.<sup>13</sup>

- The above problems of identification and inference (especially acute for the necessitarian) are just the tip of the iceberg. **Regularity theorists** are likewise acutely confronted with the **problem of vacuous instances**, as well as related problems of **possibility** (discussed, for instance, in Ayer on p. 817-819)

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<sup>9</sup> As alluded to here and there throughout the course, this notion shows up prominently for instance in Platonism: where universals (Forms) are believed to have an ontological status underwriting the particulars they instantiate. This is an example of *property realism*. On the other hand, *nominalists* and *conceptualists* beg to differ: For the former, a property is just a convenient *term of classification*, for the latter, properties merely represent concepts (nothing real in the world.)

<sup>10</sup> *Extensions* of a predicate are the classes of all entities satisfying the predicate. *Intensions* of predicates is a more subtle (and controversial) notion hingeing on notions like 'meaning.' For example, consider some predicate  $\Phi$  like "all integers between 0 and 10 (inclusive)."  $\Phi$ 's *extension* is obviously:  $\{0,1,2,3,4,5,6,7,8,9,10\}$ .  $\Phi$ 's *intension* on the other hand would include statements like :

" $n \in \mathbb{Z} \mid 0 \leq n \leq 10$ ." **Note that different intensions can correspond to the same extension!** For instance, another intension for  $\Phi$  could be: " $r = \frac{n}{m} \in \mathbb{Q} \mid 0 \leq r \leq 10 \ \& \ m = 1$ " (I.e. 'all rational numbers between 0 and 10 inclusive with denominator = 1.')

<sup>11</sup> See **CC1998**, 888-889.

<sup>12</sup> Recall the *salva veritate* as discussed in Quine (optional reading).

<sup>13</sup> Dretske disagrees, and pins intension on the *identification* of the properties, but the *inference* for Dretske is *extensional*.

Recall Ayer's example, that expressing some law in universal conditional form:<sup>14</sup>

"All Ravens are black" (for example) :  $\forall x: Rx \rightarrow Bx$  admits of the *vacuous instance*, i.e. when the premise is false, the material universal conditional is automatically true.<sup>15</sup>

Thus we shall have to take it as a universal truth both that all winged horses are spirited and that all winged horses are tame...the same will hold for any property that we care to choose. **But surely we do not wish to regard the ascription of any property whatsoever to winged horses as the expression of a law of nature.** (817)

An obvious fix, and in lines with the regularist way of thinking, is to qualify the above :  $\forall x: Px \rightarrow Qx$  with:  $\exists x: Px$  ('there exists at least one  $x$  such that  $Px$ ') i.e. ruling out the vacuous case. But as Ayer goes on to show, this maneuver is too restrictive: it would rule out laws like Newton's first law: "All bodies subject to no forces will experience 0 acceleration, or propagate at constant velocity." The case can be made that no such bodies exist (all bodies are subject to *some* force(s)).<sup>16</sup> As Ayer writes earlier, however, citing Poincare's conventionalism, is one way one could ascribe vacuous laws as having a constitutive or *definitional* character. (813)

There remains another problem, however, following the heels of the vacuous instance problem. Most laws are written in some general mathematical form, like:  $F = ma$ ,  $PV = nRT$ . The variables are part of the real number continuum, and hence, *very few empirical instances will actually instantiate such laws.*<sup>17</sup> **What is the regularity theorist to say concerning the (uncountably infinite) classes of instances that *never* are empirically actualized(able?)**

[T]here seems to be no other way of accounting for the difference between generalizations of law and generalizations of fact...**what we want to say is that whereas generalizations of fact cover only actual instances, generalizations of law [should] cover possible instances as well. But this notion of possible, as opposed to actual, instances has not yet been made clear.** (820)

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<sup>14</sup> Recall **Lecture II**. **Note however:** the generic Russellian universal conditional form:  $\forall x: Px \rightarrow Qx$ , is not the same notion as Dretske's *FG* form as mentioned above in page 3. The " $\rightarrow$ " here is the basic **material conditional**:  $\forall x: Px \rightarrow Qx \equiv \exists x: Px \wedge \sim Qx$ . Whereas Dretske's  $\rightarrow$  comes equipped with stronger notions. Note that for Ayer (as opposed to the Lambert & Britten reading) **statistical generalizations are also included as laws**. Ayer defers to the non-trivial (but for him non-problematic) issue of confirmation and statistical methodology to account for the difference between sample ratios and general statements of probability.

<sup>15</sup> Discussed in **Lecture II**.

<sup>16</sup> This case is taken up in greater detail by Nancy Cartwright, who is an anti-realist about component forces, and indeed about laws in general: Laws sacrifice their truth-content for their explanatory power. One can see Cartwright's anti-realism here as expanding on what Ayer states: "Having deprived ourselves of the power of expressing empirical generalizations, we should have to make our existential statements do the work instead." (814)

<sup>17</sup> For instance, *only measured quantities are rational numbers*.

- What Ayer is alluding to is the issue that our notion of lawhood *should support counterfactual instances, i.e. pertain as well to subjective conditional statements*. For instance, in the case of Newton's Second Law ( $F = ma$ ) we'd want to say the relation holds *if* the measured mass is *an irrational quantity as well* (even though of course no such 'measurements' can actually ever be made.)
- In the end, based on his replies to Ryle and his use of Ramsey's logical and metaphysical notions (rendering universal and particular on equal ontological footing) Ayer thinks there *is* no solution to the above worries. What Ayer offers, in 'cludgy' fashion are a list of *epistemic sufficiency conditions* which would distinguish a generalization of law from that of fact (summarized in the second paragraph, p. 824). Ayer makes no pretense to having *fixed necessary conditions* for natural law. Good logical empiricist that he is, he wants to leave the issue open, which for him means new laws can be discovered.
- Regarding the same worries, restricted though to universal *FG* form, Lambert and Britten appear more optimistic, stating (somewhat in slogan form) that what distinguishes a law from some vacuous or factual generalization is the former's "systematic[] connect[ion] with a larger [scientific] theoretical framework." (231) Though this should not be read as a panacea, it does allude at least to how laws may function within theory-complexes (*viz.* topics like intertheoretic reduction, what we'll study later).
- Last but not least, note also Carroll's more general survey, specifically alluding to David Lewis' methodological and epistemic notion of "deductive strength."