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As an adjective, the term «Deontic» is traditionally used in the sense of «directive», «normative», «prescriptive», «concerning ought». As a noun, «Deontics» is later introduced by Amedeo G. Conte, referring to the analysis of the theoretical and philosophical foundations of Deontic Logic. Within the wide field of Contian Deontics, I am dealing here with five questions: a) the distinction between «categorical constitutivity» and «hypothetical constitutivity»; b) the typology of the concept of validity; c) the problem of the pragmatic ambivalence of deontic utterances; d) the conception of repeal as an act of rejection; e) the reinterpretation of the «Is-ought question».

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«Technological Escalation and the Exploration Model of Natural Science»

TECHNOLOGICAL ESCALATION AND THE EXPLORATION MODEL OF NATURAL SCIENCE

Nicholas Rescher

§0.— SYNOPSIS

(1) Our cognitive competence is well accounted for by our evolutionary niche in the world's scheme of things. (2) The development of inquiry in natural science is best understood on analogy with exploration — to be sure, not in the geographical mode but rather exploration in nature's parametric space of such physical quantities as temperature, pressure, and field strength. (3) The technology-mediated exploration at issue here involves an interaction between us humans and nature that becomes increasingly difficult (and expensive) as we move ever farther away from the home base of the accustomed environment of our evolutionary heritage. The course of scientific progress accordingly involves a *technological escalation* — an ascent to successively higher levels of technological sophistication that is unavoidably required for the production of the requisite observational data.

§1.— ACCOUNTING FOR OUR COGNITIVE COMPETENCE

How is it that we humans are actually so competent in coping in the domain of cognitive complexity? How is it that we possess the intellectual talent to create mathematics, medicine, science, engineering, architecture, literature, and other comparably splendid cognitive disciplines? What explains the immense power of our intellectual capacities?

To be sure, at a level of high generality the answer is relatively straightforward. Basically, we are so intelligent because this is our place in evolution's scheme of things. Different sorts of creatures have different ecological niches, different specialties that enable them to find their evolutionary way along the corridor of time. Some are highly prolific, some very hard, some swift of foot, some difficult to spot, some extremely timid. *Homo sapiens* are different. For the evolutionary instrument of our species is intelligence — with everything that this involves in the way of abilities and versatilities. Thus if we weren't so intelligent, we wouldn't be here as the anatomical creatures we are. We have all these splendid intellectual capacities because we require them in order to be ourselves.

Of course it's not all just a matter of fate's lottery bringing intelligence our way. Evolution's bio-engineering is the crucial factor. Bees and termites can achieve impressive prodigies of collective effort. But an insect developed under the aegis of evolution could not become as smart as a man because the information-processing requirements of its lifestyle are too modest to push its physical resources to the development of intelligence.

Intelligence are an inherent concomitant of our physical endowment. Our bodies have many more independently movable parts (more «degrees of freedom») than do those of most other creatures.[1] This circumstance has significant implications. Suppose a system with **n** switches, each capable of assuming an ON or OFF position. There are then 2^n states in which the system can find itself. With **n**=3 there are only 8 system-states, but with **n** doubling to 6 there are already 64 states. As a body grows more complex and its configuration takes on more degrees of freedom, the range of alternative possible states expands rapidly (exponentially). Merely keeping track of its actual position is already difficult. To plan ahead is more difficult yet. If there are **m** possible states which the system can now assume, then when it comes to selecting its next position there are also **m** choices, and for the next two there are $\mathbf{m}^2$ alternatives overall (ignoring unrealizable combinations). So with a two-step planning horizon the 3-state system has 64 alternatives while that 6-state system has 4096. With a mere doubling of states, the planning problem has become complicated by a factor of sixty-four.

The degrees of freedom inherent in variable movement over time are pivotal considerations here. The moment one walks upright and begins to develop the modes of motion that this new posture facilitates — by way of creeping, running, leaping, etc. — one has many more factors of physical movement to manage.

Considerations of this sort render it evident that a vertebrate having a more highly articulated skeleton, with many independently operable bones and bone-complexes, faces vastly greater difficulties in control and manipulation — in what military jargon calls «command and control.» Versatile behavior involves more complex management. Physically more versatile animals have to be smarter simply because they are physically more versatile.

We are driven to devising greater capabilities in information acquisition and processing by the greater demands of the lifestyle of our ecological niche. The complexity of our sophisticated surveillance mechanisms in the context of friend-or-foe identification is an illustration. We can observe at a considerable distance that people are looking at us, discriminating minute differences in eye orientation in this context. The

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[1] The human skeleton has some 220 bones, about the same number as a cat when tail bones are excluded. A small monkey has around 120. Of course, what matters for present purposes is *independently* moving parts. This demotes «thousand leggers» and — thanks to fingers, among other things — takes us out of the cat's league.

development of our sophisticated senses with their refined discrimination of odors, colors, and sounds is another example. Environmental surveillance is crucial for our lifestyle. We have to know which feature of our environment to heed and which can safely be ignored. The handling of such a volume of information calls for selectivity and for sophisticated processing mechanisms — in short, for intelligence. Not only must our bodies be the right size to support our physical operations and activities, but our brains must be so as well.

The complexities of information management and control pose unrelenting evolutionary demands. To process a large volume of information nature must fit us out with a large brain. A battleship needs more elaborate mechanisms for guidance and governance than a row boat. A department store needs a more elaborate managerial apparatus than a corner grocery. Operating a sophisticated body requires a sophisticated brain. The evolution of the human brain is the story of nature's struggles to provide the machinery of information management and operative control needed by creatures of increasing physical versatility. A feedback cycle comes into play — a complex body requires a larger brain for command and control, and a larger brain requires a larger body whose operational efficiency in turn places greater demands on that brain for the managerial functions required to provide for survival and the assurance of a posterity. As can be illustrated by comparing the brain weights of different mammalian species, the growing complexities and versatilities of animal bodies involve a physical lifestyle whose difficulties of information processing and management requires increasingly powerful brains. How one makes one's living matters: insect-eating and fruit-eating monkeys have heavier brains, for their size, than leaf-eating ones do.[2]

Here then is the immediate (and rather trivial) answer to our question: We are as intelligent as we are because that is how we have had to evolve to achieve our niche in nature's scheme of things. We are so smart because evolution's bio-engineering needs to provide those smarts for us to achieve and maintain the lifestyle appropriate to our ecological niche.

But there remains the problem of why evolution would take this course. Surely we didn't need to be *that* smart to outwit the saber toothed tiger or domesticate the sheep. Let us explore this developmental aspect of the matter a little.

The things we have to do to manage our lifestyle must not only be *possible* for us, they must in general be *easy* for us (so easy that most of them can be done unthinkingly and even unconsciously). If our problem-solving resources were frequently strained to the limit, often groaning under

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[2] At any given time in evolutionary history, the then-current herbivores tended to have smaller brains than the contemporary carnivores. See Richard Dawkin, *The Blind Watchmaker* (New York: Norton, 1986), p. 190.

the weight of difficulty of the problems that they are called on by nature to solve in the interests of our lifestyle, then we just wouldn't have achieved this *modus operandi.*

For evolution to do its work, the survival problems that creatures confront have to be by and large easy for the mechanisms at their disposal. And this fundamental principle holds just as true for cognitive as for biological evolution. If cognitive problem-solving were too difficult for our mental resources, we wouldn't evolve as problem-solving creatures. If we had to go to as great lengths to work out 2+2 as to extract the cube root of a number, or if it took us as long to discriminate 3- from 4-sided figures as it takes to discriminate between 296 and 297-sided ones, then these sorts of issues would simply remain outside our repertoire. The «average» problems of survival and thriving that are posed by our lifestyle must be of the right level of difficulty for us — that is, they must be relatively easy. And this calls for excess capacity. All of the «ordinary» problems of one's mode of life must be solvable quickly in real time — and with enough idle capacity left over to cope with the unusual.

A brain that is able to do the necessary things when and as needed to sustain the life of a complex and versatile creature will remain underutilized much of the time. To cope during times of peak demand, it will need to have a great deal of excess capacity to spare for other issues at slack times. And so, any brain powerful enough to accomplish those occasionally necessary tasks must have the excess capacity to pursue at most normal times various challenging projects that have nothing whatsoever to do with survival.

These deliberations resolve the objection that evolution cannot explain our intellectual capacities because we are a lot smarter than evolution demands — that, after all, nature does not quiz us on higher mathematics or theoretical physics. What is being maintained here is not the absurd contention that such disciplines as such are somehow an evolutionary requisite. All that is being said is that the capacities and abilities that make such enterprises possible are evolutionarily advantageous — that evolution equips us with a reserve capacity that makes them possible as a side-benefit. The point is that an intelligent creature whose capacities do not allow of development in these abstract directions just isn't smart enough to pass evolution's examinations in other matters — that is, would not be able to make intelligence its evolutionary specialty after all.

The brain/computer analogy once again proves helpful in this connection. Very different things can be at stake with being «simple»: the simplicity of «hardware» involved with comparatively less complex *computers* is one sort of thing, while the simplicity of «software» at issue with comparatively less complex *programs* is something quite different. And there are clearly tradeoffs here: solving problems of the same level of difficulty is generally easier to program on more sophisticated (more complex) computing machines. Something of an inverse relationship obtains: greater machine complication can make the actual use of the machine easier and less demanding. And this circumstance is reflected in the fact that a creature which makes its evolutionary way in the world by intelligence requires a rather powerful brain.

To be sure, evolution is not, in general, over-generous. For example, evolution will not develop creatures whose running-speed is vastly greater than what is needed to escape their predators, to catch their prey, or to realize some other such strictly utilitarian objective. But intelligence and its works are a clear exception to this general rule, owing to its self-catalyzing nature. With *cognitive* artifacts as with many *physical* artifacts, the character of the issues prevents a holding back; when one can do a little with calculation or with information processing, one can in principle do a great deal. Once evolution opens the door to intelligence, it gets «the run of the house.» When bio-design takes the route of intelligence to secure an evolutionary advantage for a creature, it embarks on a slippery slope. Having started along this road, there is no easy and early stop. For once a species embarks on intelligence as its instrument for coping with nature, then the pressure of species-internal competition enters as a hot-house forcing process. Intelligence itself becomes a goad to further development simply because intelligence is, as it were, developmentally self-energizing.

The result of the preceding deliberations is straight-forward. Intelligence is the evolutionary specialty of *homo sapiens*. If we were markedly less smart than we in fact are, we would not have been able to survive. Or rather, more accurately, we would not have been able to develop into the sort of creatures we have become. Intelligence constitutes the characteristic specialty that provides the comparative advantage which has enabled our species to make its evolutionary way into this world's scheme of things. We are so smart because this is necessary for *us* to be here at all.[3]

In the course of deploying our intelligence on the world about us we arrived ultimately at the project of natural science. Gradually our natural curiosity got the better of us and we began to push the project of inquiry beyond the level of actual need.

§2. THE EXPLORATION MODEL OF SCIENTIFIC INQUIRY

In cultivating scientific inquiry, we scan nature for interesting phenomena and grope about for the explanatory useful regularities they may suggest. As a fundamentally inductive process, scientific theorizing calls for devising the least complex theory structure capable of accommodating the available data. At each stage we try to embed the phenomena and their regularities within the simplest (cognitively most efficient) explanatory structure able to answer our questions about the world and to guide our

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[3] The issues of this section are treated in greater detail in the author's *A Useful Inheritance* (Savage MD: Rowman & Littlefield, 1990).

interactions in it. But step by step as the process advances, we are driven to further, ever greater demands arise which can be met only with an increasingly more powerful technology of data exploration and management.

In theory, a prospect of unending scientific progress lies before us. But its practical realization is something else again. One of the most striking and important facts about scientific research is that the ongoing resolution of significant new questions faces increasingly high demands for the generation and cognitive exploitation of data. Though the veins of cognitive gold run on, they become increasingly difficult — and expensive — to mine.

In developing natural science, we humans began by exploring the world in our own locality, not just our spatial neighborhood but — more far-reachingly — our *parametric* neighborhood in the space of physical variables such as temperature, pressure, and electric charge. Near the «home base» of the state of things in our accustomed natural environment, we can operate with relative ease and freedom — thanks to the evolutionary attunement of our sensory and cognitive apparatus — in scanning nature with our unassisted senses for data regarding its modes of operation. But in due course we accomplish everything that can be managed by these straightforward means. To do more, we have to extend our probes into nature more deeply, deploying increasing technical sophistication to achieve more and more demanding levels of interactive capability. We have to move ever further away from our evolutionary home base in nature toward increasingly remote observational frontiers. From the egocentric standpoint of our local region of parameter space, we journey ever more distantly outward to explore nature's various parametric dimensions in the search for cognitively significant phenomena.

The appropriate picture is not, of course, one of geographical exploration but rather of physical exploration — and subsequent theoretical systematization — of phenomena distributed over the parametric space of the physical quantities spreading out all about us. This approach in terms of exploration provides a conception of scientific research as a prospecting search for the new phenomena demanded by significant new scientific findings. As the range of telescopes, the energy of particle accelerators, the effectiveness of low-temperature instrumentation, the potency of pressurization equipment, the power of vacuum-creating contrivances, and the accuracy of measurement apparatus increases — that is, as our capacity to move about in the parametric space of the physical world is enhanced — new phenomena come into view. After the major findings accessible via the data of a given level of technological sophistication have been achieved, further major findings become realizable only when one ascends to the next level of sophistication in data-relevant technology. Thus the key to the great progress of contemporary physics lies in the enormous strides which an ever more sophisticated scientific technology has made possible through enlarging the observational and experimental basis of our theoretical knowledge of natural processes. A homely fishing analogy of Eddington's is useful here. He saw the experimentalists as akin to a fisherman who trawls nature with the net of his equipment for detection and observation. Now suppose (says Eddington) that a fisherman trawls the seas using a fishnet of two-inch mesh. Then fish of a smaller size will simply go uncaught, and those who analyze the catch will have an incomplete and distorted view of aquatic life. The situation in science is the same. Only by improving our observational means of trawling nature can such imperfections be mitigated.[4]

This idea of the exploration of parametric space provides a basic model for understanding the mechanism of scientific innovation in mature natural science. New technology increases the range of access within the parametric space of physical processes. Such increased access brings new phenomena to light, and the examination and theoretical accommodation of these phenomena is the basis for growth in our scientific understanding of nature.

§3.— TECHNOLOGICAL ESCALATION: AN ARMS RACE AGAINST NATURE

Natural science is fundamentally empirical, and its advance is critically dependent not on human ingenuity alone but also on the ongoing enhancement of our technologically facilitated interactions with nature. The days are long past when useful scientific data could be had by unaided sensory observation of the ordinary course of nature. Artifice has become an indispensable route to the acquisition and processing of scientifically useful data. The sorts of data on which discovery in natural science nowadays depends can be generated only by technological means. The discoveries of today cannot be made with yesterday's equipment and techniques. To conduct new experiments, to secure new observations, and to detect new phenomena, an ever more powerful investigative technology is needed.

The pursuit of natural science as we know it embarks us on a literally endless endeavor to improve the range of effective experimental intervention, because only by operating under new and heretofore inaccessible conditions of observational or experimental systemization — attaining extreme temperature, pressure, particle velocity, field strength, and so on — can we realize situations that enable us to put knowledge-expanding hypotheses and theories to the test. As one acute observer has rightly remarked: «Most critical experiments [in physics] planned today, if they had to be constrained within the technology of even ten years ago, would be seriously compromised.»[5]

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4 See A. S. Eddington, *The Nature of the Physical World* [New York, 1928].

5 S D. A. Bromley et al. *Physics in Perspective. Student Edition* (Washington, D.C., 1973); pp. 16, 13. See also Gerald Holton, «Models for Understanding the Growth and Excellence of Scientific Research,» in Stephen R. Graubard and

This situation points toward the idea of a «technological level,» corresponding to a certain state-of-the-art in the technology of inquiry in regard to data-generation and processing. This technology of inquiry falls into relatively distinct levels or stages in sophistication — correlatively with successively «later generations» of instrumentation and manipulative machinery, which are generally separated from one another by substantial (roughly, order-of-magnitude) capacity improvements in regard to such information-providing parameters as measurement exactness, data-processing volume, detection sensitivity, high voltages, high or low temperatures, and the like.

Physicists often remark that the development of our understanding of nature moves through successive layers of *theoretical* sophistication.[6] But scientific progress is clearly no less dependent on continual improvements in strictly *technical* sophistication:

> Some of the most startling technological advances in our time are closely associated with basic research. As compared with 25 years ago, the highest vacuum readily achievable has improved more than a thousand-fold; materials can be manufactured that are 100 times purer; the submicroscopic world can be seen at 10 time higher magnification; the detection of trace impurities is hundred of times more sensitive; the identification of molecular species (as in various forms of chromatography) is immeasurably advanced. These examples are only a small sample.... Fundamental research in physics is crucially dependent on advanced technology, and is becoming more so.[7]

Without an ever-developing technology, scientific progress would cease. The discoveries of today cannot be advanced with yesterday's instrumentation and techniques. To secure new observations, to test new

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Gerald Holton, eds., *Excellence and Leadership in the Democracy* (New York, 1962), p. 115.

[6] «Looking back, one has the impression that the historical development of the physical description of the world consists of a succession of layers of knowledge of increasing generality and greater depth. Each layer has a well defined field of validity; one has to pass beyond the limits of each to get to the next one, which will be characterized by more general and more encompassing laws and by discoveries constituting a deeper penetration into the structure of the Universe than the layers recognized before.» (Edoardo Amaldi, «The Unity of Physics,» *Physics Today.* vol. 261, no. 9 [September 1973], p. 24.) See also E. P. Wigner, «The Unreasonable Effectiveness of Mathematics in the Natural Sciences, «*Communication on Pure and Applied Mathematics*, vol. 13 (1960), pp. 1-14; as well as his «The Limits of Science,» *Proceedings of the American Philosophical Society*, vol. 93 (1949), pp.521-526. Compare also Chapter 8 of Henry Margenau, *The Nature of Physical Reality* (New York, 1950).

[7] D. A. Bromley et al., *Physics in Perspective. Student Edition* (Washington D.C., 1973; National Research Council/National Academy of Science Publications), p.23.

hypotheses, and to detect new phenomena, an ever more powerful technology of inquiry is needed. Scientific progress depends crucially and unavoidably on our technical capability to penetrate into the increasing distant — and increasingly difficult — reaches of the spectrum of physical parameters in order to explore and to explain the ever more remote phenomena encountered there.

The instrumentalities of scientific inquiry can be enhanced not only on the side of theoretical resources but preeminently on the side of technology of observational and experimental intervention. Pioneering scientific research will always operate at the technological frontier. For revealing here further «secrets» nature inexorably exacts a drastically increasing effort in to the acquisition and processing of data. This accounts for the recourse to more and more sophisticated technology for research in natural science.

No doubt, nature is in itself uniform as regards the distribution of its diverse processes across the reaches of parameter space. It does not favor us by clustering them in our accustomed parametric vicinity: significant phenomena do not dry up outside our parochial neighborhood. And phenomenological novelty is seemingly inexhaustible: we can never feel confident that we have got to the bottom of it. Nature always has fresh reserves of phenomena at her disposal, hidden away in those ever more remote regions of paramative space. Successive stages in the technological resources of scientific inquiry accordingly lead us to ever-different views about the nature of things and the character of their laws.

The salient characteristic of this situation is that, once the major findings accessible at a given level of sophistication in data-technology level have been attained, further substantial progress in any given problem area requires ascent to a higher level on the technological scale. Every data-technology level is subject to discovery saturation: once the potential of a given state-of-the-art level has been exploited, not all our piety or wit can lure the technological frontier back to yield further significant returns at this stage. Further substantive findings become realizable only by ascending to the next level of sophistication in data-relevant technology. But the exhaustion of the prospects for data extraction at a given data-technology level does not, of course, bring progress to a stop. Rather, the need for enhanced data forces one to look further and further from man's familiar «home base» in the parametric space of nature.

The requirement for technological progress to advance scientific knowledge has far-reaching implications for the nature of the enterprise. For the increasing technological demands that are requisite for scientific progress means that each step ahead gets more complex and more expensive as those new parametric regions grow increasingly remote. With the progress of science, nature becomes less and less yielding to the efforts of further inquiry. We are faced with the need to push nature harder and harder to achieve cognitively profitable interactions. The dialectic theory and experiment carries natural science ever deeper into the range of greater costs. We thus arrive at the phenomenon of *technological escalation.* The need for new data forces us to look further and further in parametric space. Thus while scientific progress is in principle always possible — there being no absolute or intrinsic limits to significant scientific discovery — the realization of this ongoing prospect demands a continual enhancement in the technological state of the art of data extraction or exploitation. Given that we can only learn about nature by interacting with her, Newton's third law of countervailing action and reaction becomes a fundamental principle of epistemology. Everything depends on just how and *how hard* we can push against nature in situations of observational and detectional interaction. As Bacon saw, nature will never tell us more than we can forcibly extract from her with the means of interaction at our disposal. And because this extraction can only be realized by ever deeper probings, this state of affairs has far-reaching implications for the perfectibility of science. The impetus to augment our science demands an unremitting and unending effort to enlarge the domain of effective experimental intervention. That there is «pay dirt» deeper down in the mine avails us only if we can actually dig there. New forces, for example, may well be in the offering, if one able physicist is right:

> We are familiar, to varying degrees, with four types of force: gravity, electricity, the strong nuclear force that holds the atomic nucleus together and the weak force that brings about radioactive decay by the emission of electrons.... Yet it would indeed be astonishing if . . . other types of force did not exist. Such other forces could escape out notice because they were too weak to have much distinguishable effect or because they were of such short range that, no matter whether they were weak or not, the effects specifically associated with their range were contained within the objects of the finest scale that our instruments had so far permitted us to probe.[8]

But, of course, such weak forces would enter into our picture of nature only if our instrumentation were able to detect them. This need for a constant enhancement of scientifically relevant technology lies at the basis of the enormous increase in the human and material resources needed for modern experimental science. Frontier research is true *pioneering:* what counts is not just doing it but doing it *for the first time.* Aside from the initial reproduction of claimed results needed to establish the reproducibility of reproducibility of results, repetition in *research* is in general pointless. As one acute observer has remarked, one can follow the diffusion of scientific technology «from the research desk down to the schoolroom»:

> The emanation electroscope was a device invented at the turn of the century to measure the rate at which a gas such as thorium loses its radioactivity. For a number of years it seems to have been used only in the research laboratory. It came into use in instructing graduate students in the mid-1930's, and in college courses by 1949. For the last few years a cheap commercial model

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[8] Sir Denys H. Wilkinson, *The Quarks and Captain Ahab* or: *The Universe as Artifact* (Stanford, 1977; Schiff Memorial Lecture), pp. 12-13.

> has existed and is beginning to be introduced into high school courses. In a sense, this is a victory for good practice; but it also summarizes the sad state of scientific education to note that in the research laboratory itself the emanation electroscope has long since been removed from the desk to the attic.[9]

In science, as in a technological arms race, one is simply never called on to keep doing what was done before. An ever more challenging task is posed by the constantly *escalating* demands of science for the enhanced data that can only be obtained at the increasingly costly new levels of technological sophistication. One is always forced further up the mountain, ascending to ever higher levels of technological performance — and of expense. As science endeavors to extend its «mastery over nature,» it thereby comes to be involved in a technology-intensive arms race against nature, with all of the practical and economic implications characteristic of such process.

The exploration of nature's parametric space confronts us with the reality of physical limits: particle velocities in accelerations are limited by the speed of light, temperatures in low temperature research are limited by absolute zero, vacuums are limited by condition of emptiness, temperatures by the cosmic boiling point of the big bang. And such limits amount to resistance barriers. With every step we take towards them every time we move from where we are to 10% closer yet — we find it exponentially more difficult to take yet further steps as the technological demands for further progress grow increasingly massive.

The enormous power, sensitivity, and complexity deployed in present-day experimental science have not been sought for their own sake but rather because the research frontier has moved on into an area where this sophistication is the indispensable requisite of ongoing progress. Nature's inherent complexity means that in science, as in war, the battles of the present cannot be fought effectively with the armaments of the past.[10]

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9 Gerald Holton, «Models for Understanding the Growth and Excellence of Scientific Research,» in Stephen R. Graubard and Gerald Holton (editors), *Excellence and Leadership in a Democracy* (New York, 1962), p. 115.

10 Some of the themes of this chapter are also addressed in Chapter 7 «Cost Escalation in Empirical Inquiry» of the author's *Cognitive Economy* (Pittsburgh: University of Pittsburgh Press, 1989). *Scientific Progress* (Oxford: Basil Blackwell,1978), and *The Limits of Science* (Berkeley and Los Angeles: University of California Press, 1984) are also relevant.

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«Deontics between Semantics and Ontology»

DEONTICS BETWEEN SEMANTICS AND ONTOLOGY

Carlos Alarcón Cabrera

§1.

The term «Deontics», with its current meaning, constitutes a remarkable contribution to the Philosophy of Normative Language by Amedeo G. Conte. Going back to Aristotle, Conte defines «Deontics» as «theory of '*Sollen*' *qua* '*Sollen*'», as «theory of 'ought' *qua* 'ought'». The same way Metaphysics, as «theory of '*Sein*' insofar as '*Sein*'», studies *Sein* in its «*constitutive onticity*», Deontics studies *Sollen* in its «*constitutive deonticity*».[1]

Unlike the term «Deontics», the expression «Deontic Logic» was first used before, with its current meaning, by Georg H. von Wright (1951) when he mentioned the deontic modal concepts (what is obligatory, what is permitted, what is forbidden) together with the alethic modal concepts (necessity, possibility, contingency — concepts which are studied in modal logic), the existential modal concepts (universality, existentiality, emptiness — concepts which are studied in the theory of quantifiers) and the epistemic modal concepts (what is verified, what is undecided, what is falsified).[2]

As an adjective, the term «Deontic» became more common in the philosophical lexicon. As Tecla Mazzarese points out, it was particularly used both in a pragmatic sense and a semantic sense: a) Pragmatically, as a synonym for «directive», «preceptive», «prescriptive», «normative», as opposed to «descriptive», «declarative», «assertive»; b) Semantically, in the sense of «concerning ought», to designate what constitutes the scope of ought or what describes the scope of ought.[3]

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1 Amedeo G. CONTE, «Deontica aristotelica», 1992, p. 182.

2 Georg H. von WRIGHT, «Deontic Logic», 1951, pp. 1 ff..

3 Tecla MAZZARESE, *Logica deontica e linguaggio giuridico*, 1989, pp. 3-5; *Deontica*, 1990, pp. 5-17. Cf. Carlos ALARCÓN CABRERA (ed.), *Estudios de deóntica*, 1995.

As a noun, «Deontics» concerns the formal systems of deontic calculus from the point of view of their theoretical-philosophical foundations, in virtue of which Deontic Logic analyzes technical problems peculiar to those calculi.

In this paper I will focus on five of Amedeo G. Conte's main contributions to the Philosophy of Normative Language:

In section 2, on the distinction between «categorical constitutivity» and «hypothetical constitutivity».

In section 3, on the typology of the concept of validity.

In section 4, on the notion of «pragmatic ambivalence» of deontic utterances.

In section 5, on the conception of repeal as an act of rejection.

In section 6, on the reinterpretation of the «Is-ought question».

§2.

2.1. In Contian Deontics, the Philosophy of constitutive rules plays an essential role. These rules have been defined by Conte as the «prius» of what they deal with in the threefold sense of being (eidetic) conditions of conceivability, (alethic) conditions of possibility and (noetic) conditions of perceptibility for what they deal with. Constitutive rules deal with neither chronologically preexistent nor with ontologically independent acts, situations or entities, but they do constitute by themselves the activity they deal with and, in it, their praxis.[4]

The distinction between «categorical constitutivity» and «hypothetical constitutivity» is parallel to the distinction between the notions of «constitutive rule» and «hypothetic-constitutive rule», a distinction which Conte expresses in ontological terms and semiotic terms:[5]

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[4] Cf. Amedeo G. CONTE, «Regola costitutiva in Wittgenstein», 1981, pp. 59 ff.; «Paradigmi d'analisi della regola in Wittgenstein», 1983, pp. 37 ff.; «Regola costitutiva, condizione, antinomia», 1983, pp. 21 ff.; «Phénoménologie du langage déontique», 1985, pp. 175 ff.; «Materiali per una tipologia delle regole», 1985, pp. 345 ff.; «Regole eidetico-costitutive», 1985, pp. 26 ff.; «Fenomeni di fenomeni», 1986, pp. 29 ff.; «Semiotics of Constitutive Rules», 1988, pp. 143 ff.; «Eidos. An Essay on Constitutive Rules», 1988, pp. 251 ff.; «Costitutività di regole», 1989, col. 462 ff.; «L'enjeu des règles», 1991, pp. 122 ff.; «Deontica wittgensteniana», 1993, pp. 115 ff.

[5] Amedeo G. CONTE, «Regola costitutiva in Wittgenstein», 1981, pp. 59-66; «Regola costitutiva, condizione, antinomia», 1983, pp. 23 ff.; «Phénoménologie du langage déontique», 1985, pp. 187-190; «Materiali per una tipologia delle regole», 1985, pp. 361-364; «Eidos. An Essay on Constitutive Rules», 1988, pp. 252-256.

a) In ontological terms, constitutive rules *are* conditions for the activities with which they deal: «X counts as Y», «X has the value of Y»; hypothetic-constitutive rules *pose* conditions for an act or circumstance to have a particular value: «X must be N to count as Y», «X must be N to have the value of Y». Thirdly, technical rules neither *are* a condition nor *pose* conditions, but they *presuppose* conditions: they prescribe behaviours under the *subjective condition* of pursuing an aim and insofar as these behaviours are an *objective condition* of obtaining the aim which is being pursued.

b) From a semiotic point of view, constitutive rules *determine* the *connotation* of those terms which designate the praxis that the rules constitute. Hypothetic-constitutive rules do not *determine*, but they *presuppose* the *connotation* of those terms which designate the praxis that the rules constitute; that is, hypothetic-constitutive rules establish the *denotation* of these terms by posing conditions of validity for the entities designated by them.

2.2. In «Deontic Logic and the Theory of Conditions» (1968), von Wright does not consider deontic logic an inmediately analogue to modal logic, but a fragment of the Logic of Sufficient and Necessary Conditions, so that saying that something ought to be amounts to asserting that something is a necessary condition of something else.[6]

In this system of conditional logic, the notion of necessary condition is explained like this: «the truth of the proposition that p is a necessary condition of the truth of the proposition that q». Its formal representation may be one of the following:

[1] $Nc\ (p,q)$

[2] $N\ (q \rightarrow q)$

In fact, saying that «p» is a necessary condition of «q» means that if «~p», then «~q», or, likewise, that if «q», then necessarily «p». In terms of necessary condition, deontic operator O can be defined:

[3] $Op = Nc\ (p, I)$

That something ought to be the case means that the thing in question is a necessary condition of a certain thing (proposition, state of affairs) *I*, which is presupposed in that context. *I* is not a variable but a propositional constant.

Moreover, the notion of sufficient condition can be explained like this: «the truth of the proposition that p is a sufficient condition of the truth of the proposition that q». Its formal representation can be one of the following:

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[6] Georg H. von WRIGHT, «Deontic Logic and the Theory of Conditions», 1968.

[4] Sc (p, q)

[5] N (p → q)

In fact, saying that «p» is a sufficient condition of «q» means that if «~q», then «~p», or, likewise, that if «p» then necessarily «q». Sc (p, q) is equivalent with Sc (~q, ~p), with Nc (q, p) and with Nc (~p, ~q). In terms of sufficient condition, deontic operator P can be defined:

[6] Pp = Sc (p, I)

That something may be the case means that the thing in question is a sufficient condition of a certain thing I which is presupposed in that context.[7]

2.3. Neither the deontic category of constitutive rules nor the deontic category of hypothetic-constitutive rules is homogeneous from a conditional point of view. In an impressive essay, Giampaolo M. Azzoni made the Contian classification of constitutive rules and hypothetic-constitutive rules explicit by taking the type of condition into consideration:[8]

a) (Constitutive) rules which *are a necessary condition* for what they rule (*eidetic-constitutive rules*).

b) (Constitutive) rules which *are a sufficient condition* for what they rule (*thetic-constitutive rules*).

c) (Constitutive) rules which *are a necessary and sufficient condition* for what they rule (*noetic-constitutive rules*).

d) (Hypothetic-constitutive) rules which *pose necessary conditions* for what they rule (*anankastic-constitutive rules*).

e) (Hypothetic-constitutive) rules which *pose sufficient conditions* for what they rule (*metathetic-constitutive rules*).

f) (Hypothetic-constitutive) rules which *pose necessary and sufficient conditions* for what they rule (*nomic-constitutive rules*).

2.4. In «Norms, Truth and Logic» (1983), von Wright distinguishs between «technical ought» («must») and «deontic ought» («ought»). The technical

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7 Georg H. von WRIGHT, «Deontic Logic and the Theory of Conditions», 1968, pp. 6 ff.

8 Giampaolo M. AZZONI, «Condizioni costitutive», 1986, pp. 160 ff.; *Il concetto di condizione nella tipologia delle regole*, 1988. Cf. Piero POLLASTRO, «Fenomenologia delle regole costitutive», 1983; Tecla MAZZARESE, «Metaregole», 1985, pp. 65 ff.; Mario JORI, «In margine all'ultimo Conte», 1986, pp. 443 ff.; Riccardo GUASTINI, «Norme che sono condizioni sufficienti del loro oggetto?», 1986, pp. 213 ff.; Carlos ALARCÓN CABRERA, *Normas y paradojas*, 1993, pp. 87 ff., Carlos ALARCÓN CABRERA, «On Contian Deontics», 1995, pp. 186-188.

Ought expresses that something has to be done in order for something else to be attained. That is, the technical Ought is usually elliptic, when explicitly referring to an end which will not be attained if what «must be» — in a technical sense — «is» not. The deontic Ought is what arises directly from a norm; it is categorical, it is not a means, but an end in itself.[9]

The distinction between «must» and «ought» is taken up again in «On Conditional Obligation» (1994): in the same way it is necessary to differentiate the norm which pronounces a certain state of affairs obligatory, from the statement of practical necessity concerning what the agent to whom the norm is addressed has to do in order to satisfy his obligation, it is essential to distinguish the deontic Ought («ought») relative to the state which the norm pronounces obligatory, from the technical Ought («must») relative to what the agent has to do in order to satisfy his obligation.[10]

2.5. Anankastic-constitutive rules stand out because they exemplify the anankastic «Deon», as opposed to the deontic «Déon» («Déon», 'δέον', neuter participle of the Greek impersonal verb «Deî», 'δεῖ', is, when nominalized, the term Aristotle used when referring to normative necessity).

This opposition is basic to Deontics because, according to Conte, it goes deeply into a crucial question related to the foundation of Deontic Logic: the difference between «non-normative» necessity (and those non-normative modal concepts of possibility, impossibility and contingency) and «normative» necessity (and those normative modal concepts of prohibition, permission and indifference): anankastic Deon is an example of *non*-deontic normative necessity, of *adeontic* «Deon».[11]

The relevance of the distinction between deontic «Deon» and (adeontic) anankastic «Deon» is shown in the fact that, as Conte stresses, deontic *indifference* has no anankastic counterpart, since anankastic indifference is self-contradictory. What is more, in the same way the mere existence of a formal theory relative to *anapophantic* entities proves that logic goes beyond apophantic language, the mere possibility of a formal theory relative to *adeontic* rules (for example, anankastic-constitutive rules) proves that deontics goes beyond deontic language.[12]

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9 Georg H. von WRIGHT, «Norms, truth and logic», 1983, pp. 152-153.

10 Georg H. von WRIGHT, «On Condi«tional Obligations», 1994, p. 3.

11 Amedeo G. CONTE, «Deon in Deontics», 1991, p. 349.

12 Amedeo G. CONTE, «Deon in Deontics», 1991, pp. 352-353; «Deontica aristotelica», 1992, pp. 197 ff. Cf. Maria-Elisabeth CONTE, «Epistemico, deontico, anankastico», 1995; Giampaolo M. AZZONI, *Cognitivo e Normativo: il Paradosso delle Regole Tecniche*, 1991, pp. 19 ff.; Luigi DE CARO, «Premessa

§3.

3.1. In «Minima deontica» (1988), Conte sketched out the «deontic triangle of validity», whose three apexes represented syntactic deontic validity, semantic deontic validity and pragmatic deontic validity. To some extent, he answered this way the question he himself had posed in «Studio per una teoria della validità» (1970) eighteen years before: Of what thing can the validity which is precisely the object of the theory of validity be predicated?. At that time, Conte simply developed a tetrachotomy of the term «norm» parallel to the distinction, peculiar to the theory of speech acts, among four meanings of the term «proposition»:

> as «sentence» («*enunciato linguistico*», «*Satz*»), as «utterance» («*enunciazione d'un enunciato*», «*Äusserung*»), as «proposition» in its strict sense («*ciò che un enunciato esprime, … proposizione 'strictu sensu'*»), and as the state of things with which the sentence deals.

The tetrachotomy of «norm» was the following:[13]

a) «norm» as a deontic sentence («behaviour B is obligatory», «behaviour B is forbidden», «behaviour B is permitted»).

b) «norm» as act of deontic utterance of a deontic sentence.

c) «norm» as deontic proposition expressed by a deontic sentence.

d) «norm» as deontic status, as extralinguistic fact with which a deontic sentence deals (an obligation, a prohibition, a permission).

In «Minima deontica», Conte develops this conceptual delimitation regarding the problem of validity.

3.2. Syntactic validity, predicable of deontic status, is the validity «relative to the constitutive rules about validity, to the constitutive rules of a legal order which (conditioning the validity of deontic status in and by the legal order) determine the *syntax of validity* of that legal order».[14] Syntactic validity is therefore relative a) to a legal order (since it is validity *in* and *by*

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alla traduzione italiana della *Logica del dovere* di G. Ledig», 1993, pp. 444 and note 8; Giuseppe LORINI, «Deontica tra logica e filosofia», 1993, pp. 602 ff.; Stefano RADICE, «Regole costitutive e sillogismo normativo», 1992, pp. 422-427; Carlos ALARCÓN CABRERA, «Validità semantica e sillogismo normativo», 1995).

13 Amedeo G. CONTE, «Studio per una teoria della validità», 1970, pp. 334-342.

14 Amedeo G. CONTE, «Minima deontica», 1988, p. 436.

a legal order); b) within the legal order, «to the noetic-constitutive rule called Basic Norm (*Grundnorm*)».[15]

Syntactic validity can be «thetic» or «athetic», depending on whether the deontic status of which they are predicated are produced or not, respectively, by valid deontic acts. For Azzoni, syntactic thetic validity, as opposed to athetic syntactic validity, is relative, in a legal order, not only to the Basic Norm, but also to the hypothetic-constitutive rules about the validity of «norm-positing acts» («*atti di normazione*»).[16]

Semantic validity, predicable of deontic sentences, depends on the correspondence between a deontic sentence and a deontic status. The syntactic validity of a deontic status is a sufficient condition for the semantic validity of the corresponding deontic sentence. The deontic sentence «Smoking is forbidden in the university» is semantically valid if it is true that smoking is forbidden in the university; that is, if the deontic status «Smoking is forbidden in the university» is syntactically valid.[17]

The concepts of «thetic semantic validity» and «athetic semantic validity» reflect the theoretical controversy which confronts iuspositivism with iusnaturalism: the thetic semantic validity of a deontic sentence depends on how it corresponds with a deontic status (thetically) constituted in a legal order and by a legal order. The athetic semantic validity of a deontic sentence depends on how it corresponds, in Kalinowski's words, with «deontic reality».[18]

However, the expression «semantic validity» is, according to Conte, posterior to the concept of «semantic validity». In «In margine all'ultimo Kelsen» (1967), Conte referred to the applicability of logical principles to the validity of «prescriptive propositions» as truth (to use a later expression, to the (semantic) validity of norms as deontic sentences). He began with the

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15 Amedeo G. CONTE, «Minima deontica», 1988, note 15; «Validità», 1975, pp. 418 ff.

16 Amedeo G. CONTE, «Minima deontica», 1988, pp. 456-457; «Validità athetica», 1990, p. 163; Giampaolo M. AZZONI, «Cognitivo e Normativo: il Paradosso delle Regole Tecniche», 1991, note 61. Cf. Georg H. von WRIGHT, *Norm and Action. A Logical Enquiry*, 1963, pp. 191 ff.; Paolo DI LUCIA, *Deontica in von Wright*, 1992, pp. 30 ff.; Carlos ALARCÓN CABRERA, «Validità sintattica vs. invalidità sintattica in Theodor Geiger», 1994.

17 Amedeo G. CONTE, «Minima deontica», 1988, pp. 446-448.

18 For Azzoni, the concept of athetic semantic validity as athetic deontic truth is defined, following Kalinowski, by means of two theses: a) the thesis of «La designatività delle norme»: norms designate normative states of things; b) the thesis of «L'apofanticità delle norme»: norms may be true or false (Giampaolo M. AZZONI, «Validità semantica in deontica», 1992, pp. 171 ff.).

following hypothesis: «Prescriptive propositions can be either true or false, since they are either true or false (*ab esse ad posse valet consequentia*); they are either true or false, since they are true (a disjunction is true if one of its terms is true); they are true because they are necessarily true».[19]

Ten years later, in «Aspetti della semantica del linguaggio deontico» (1977), Conte rejected the incompatibility between truth and performativity of a deontic sentence. The fact that the performative utterance of a sentence is neither true nor false, but valid or invalid, does not mean that the sentence that is performatively uttered can be neither true nor false. On the contrary, a performative sentence is true precisely insofar as it is used in a performative way, insofar as the one who utters it, when uttering it performatively, *does* what he/she *says*: «the performativity of the utterance is a necessary and sufficient condition for the truth of the sentence».[20]

Pragmatic validity, predicable of deontic acts, either depends on the conditions of validity (thetically) posed in a legal order by hypothetic-constitutive rules («thetic» or «praxeonomical» pragmatic validity), or on the (athetic) conditions inherent in the concept of deontic acts, in their intrinsic constitution («athetic» or «praxeological» pragmatic validity).[21]

For Conte, the pragmatic validity of a deontic act is a sufficient condition but not a necessary condition for the syntactic validity of the produced deontic status. Conte points out explicitly that «the pragmatic validity (in and by a legal order S) of the thetic utterance of a deontic sentence is a sufficient condition for the syntactic validity (in and by a legal order S) of the deontic status of which the deontic act is *thésis*. The syntactic validity (in and by S) of the deontic status is, likewise, a sufficient condition for the semantic validity (in and by S) of the deontic sentence».[22]

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[19] Amedeo G. CONTE, «In margine all'ultimo Kelsen», 1967, pp. 119-120; *Primi argomenti per una critica del normativismo*, 1968, pp. 23-24.

[20] Amedeo G. CONTE, «Aspetti della semantica del linguaggio deontico», 1977, pp. 150-151. Cf. Amedeo G. CONTE, «Forma performativa», 1994; Amedeo G. CONTE, «Performativo vs. normativo», 1994; Andrea ROSSETTI, «Performativi in Jean-Louis Gardies: verità, verificabilità, vero-funzionalità», 1994.

[21] Amedeo G. CONTE, «Minima deontica», 1988, pp. 431 ff.; I question the notion of 'athetic pragmatic validity' in Carlos ALARCÓN CABRERA, «Validez pragmàtica. Una discusión con A. G. Conte», 1993, pp. 341 ff.; *Normas y paradojas*, 1993, pp. 37 ff.

[22] Amedeo G. CONTE, «Minima deontica», 1988, pp. 446-448. The thesis that the pragmatic validity of a deontic act is not a necessary condition for the syntactic validity of the produced deontic status seems acceptable to me: there may be valid deontic status (athetically valid) which are not produced by deontic

§4.

A deontic sentence is pragmatically ambivalent because it is subject to heterogeneous utterances: it is deontically uttered if it is a prescriptive deontic sentence (if it is a deontic sentence «in suppositione deontica»), or it is adeontically uttered if it is a descriptive deontic sentence (if it is a deontic sentence «in suppositione adeontica»).[23] Classic examples of deontic sentences «in suppositione adeontica» are, for Conte, the Kelsenian «*Sollsätze*», apophantic sentences on «*Sollen*».[24]

Conte explains that his thesis of the pragmatic ambivalence of deontic sentences (deontic utterance of a deontic sentence vs. adeontic utterance of a deontic sentence) does not imply the thesis of the semantic ambiguity (depending on whether it is uttered by a lawmaker or a sociologist) of adeontic sentences of the kind «Action A is punished with sanction S». Both the lawmaker and the sociologist can utter, for example, the sentence «Manslaughter is punished with twenty years imprisonment», and in neither case the sentence would be semantically ambiguous. In the first case, the lawmaker *constitutes* a *rule*, assuming as *thesis* the *relation* between *manslaughter* and the *punishment* of twenty years imprisonment, *prescribing* that sanction for that act. In the second case, the sociologist *verifies* a *regularity*, analizes the *relation* between the *norm* which punishes manslaughter with twenty years imprisonment and the *social reality describing* a situation.[25]

Different from the thesis of the pragmatic ambivalence of deontic sentences (deontic utterance of a deontic sentence vs. adeontic utterance of a deontic sentence) is the thesis of the *adeonticity* of descriptive sentences of the kind «The norm 'Manslaughter is punished with twenty years imprisonment' is (deontically) valid». From the adeontic character of sentences such as the one mentioned, Conte draws an important conclusion:

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acts. However, the thesis that the pragmatic validity of a deontic act is a sufficient condition for the syntactic validity of the produced deontic status seems to me questionable; in fact, may there not be deontic status, produced by deontic acts, which are invalid (athetically invalid)? (Vid. Carlos ALARCÓN CABRERA, «Validità sintattica vs. invalidità sintattica in Theodor Geiger», 1994).

23 Amedeo G. CONTE, «Deon in Deontics», 1991, p. 351.

24 Amedeo G. CONTE, «Minima deontica», 1988, p. 451.

25 Amedeo G. CONTE, «Deontica aristotelica», 1992, pp. 228-234. About the paradigm 'deontic regularity' vs. 'adeontic regularity' ('following a rule' vs. 'continuing on a regularity'), cf. Amedeo G. CONTE, «Codici deontici», 1976, p. 15; «Minima deontica», 1988, pp. 457-459; «Validità athetica», 1990, pp. 166-169; Theodor GEIGER, *Vorstudien zu einer Soziologie des Rechts*, 1947.

if Deontic Logic is conceived as logic of deontic sentences, it cannot be a logic of *adeontic* descriptive sentences about (deontic) validity.[26]

§5.

Conte explains the conception of repeal from a perspective that is not strictly normativist, taking as a basis Alchourrón and Bulygin's theses, *Sobre la existencia de las normas jurídicas* (1979): Sentences of the kind «Norm *n* is repealed», when *performatively* uttered, are not norms, they are «verbal expressions of acts of rejection», «*thetic acts* of invalidation of deontic status».[27]

As opposed to «rhetic» performative verbs, which mean the execution of a linguistic act which as such does not act on the truth of the sentence (that is, of a «rhetic» linguistic act which is a «*rhêsis*»; for example, communicating, commenting, replying, …), thetic performative verbs mean a position of truth, a «*thesis*», by means of a linguistic act, of the truth of a sentence.[28] «To repeal» is a «factitive» thetic verb which means the position of nontruth, *in* a convention and *by* a convention, of a sentence that is supposed to be true.[29]

The deontic validity which supresses a repealing act is syntactic validity. As Conte points out, «*obiectum affectum*» of repeal is the syntactic validity of a deontic status in a legal order; «*obiectum effectum*» of repeal is its syntactic invalidity.[30] The deontic validity predicated of a repealing act is «thetic» or «praxeonomical» pragmatic validity, a validity conditioned by

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26 Amedeo G. CONTE, «Deon in Deontics», 1991, p. 351.

27 Amedeo G. CONTE, «Tre domande sull'abrogazione», 1987, pp. 40-41. Cf. Carlos E. ALCHOURRÓN and Eugenio BULYGIN, «Sobre la existencia de las normas jurídicas», 1979; Eugenio BULYGIN, «Time and Validity», 1982; Tecla MAZZARESE, «Negazione ed abrogazione in deontica (a proposito d'un saggio di C. E. Alchourrón ed E. Bulygin)», 1981, pp. 205-216; Tecla MAZZARESE, «Variazioni in tema d'abrogazione», 1987, pp. 77-91; Giampaolo M. AZZONI, «Abrogazione, regole costitutive, validità», 1987, pp. 33-37; Carlos ALARCÓN CABRERA, «Deóntica de la validez», 1995.

28 Amedeo G. CONTE, «Aspetti della semantica del linguaggio deontico», 1977, pp. 154-162. Cf. Amedeo G. CONTE, «Adeontic Negation», 1990, pp. 75-79; «Deóntica de la negación en Jerzy Sztykgold», 1995: «Filosofía de la validez deóntica: una ecuación de tres incógnitas», 1995; Amedeo G. CONTE / Paolo Di LUCIA, «Thetic Function of Deontic Terms», 1995.

29 Amedeo G. CONTE, «Aspetti della semantica del linguaggio deontico», 1977, p. 167. Cf. Riccardo GUASTINI, «Contributo ad una teoria dell'abrogazione», 1988, pp. 630-631.

30 Amedeo G. CONTE, «Tre domande sull'abrogazione», 1987, pp. 42-43.

the hypothetic-constitutive rules which (thetically) pose the conditions of validity of a repealing act in a legal order and by a legal order.[31]

Insofar as it provokes a transition from the syntactic validity of a deontic status to its syntactic invalidity, every repealing act has, following Conte, a «*diacronicità costitutiva*». Thus, the diachronic phenomenon of repeal requires, regarding the general theory of legal order, to go beyond the tridimensional Kelsenian model. It requires for dynamic normative systems a tetradimensional model, a space-time model.[32]

§6.

As regards relations between what is *deontic* and what is *adeontic*, there is a triple risk of naturalistic fallacy. In Conte's words, there may be a «noetic» naturalistic fallacy relative to concepts, a «dianoetic» naturalistic fallacy relative to sentences, and an axiological naturalistic fallacy relative to the truth of sentences:[33]

a) Defining a deontic concept by means of adeontic concepts is a «noetic» naturalistic fallacy.[34]

b) Deriving a deontic sentence from adeontic sentences is a «dianoetic» naturalistic fallacy.[35] The fact that a norm is *dianoetic* or inferentially valid does not imply that such norm is *deontically* valid in the legal order in which the norms from which it derives (the norms in respect of which it is *dianoetically* valid) are *deontically* valid. The deontic validity

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[31] Amedeo G. CONTE, «Tre domande sull'abrogazione», 1987, pp. 41-42. Nevertheless, in «Minima deontica», Conte points out that the pragmatic validity predicated of a repealing act can also be *athetic* or *praxeological* (dependent on conditions which are not posed by rules, on conditions inherent in the concept of an act, in its intrinsic constitution). Thus, a repealing act of syntactically invalid norms would lack praxeological validity, since the act of repeal presupposes the (syntactic) validity of the norm being repealed (Amedeo G. CONTE, «Minima deontica», 1988, pp. 431-433). In my opinion, it would be better to use, in that case, the expression 'praexeonomic-eidetic validity' (pragmatic validity determined by eidetic-constitutive rules), with a meaning that would oppose that of 'praxeonomic-anankastic validity' (pragmatic validity determined by anankastic-constitutive rules. (Vid. Carlos ALARCÓN CABRERA, «Validez pragmática. Una discusión con A. G. Conte», 1993, pp. 341 ff.; *Normas y paradojas*, 1993, pp. 37 ff.).

[32] Amedeo G. CONTE, «Minima deontica», 1988, p. 441. Cf. Amedeo G. CONTE, «Ordinamento giuridico», 1966, p. 9.

[33] Amedeo G. CONTE, «Minima deontica», 1988, p. 468.

[34] Amedeo G. CONTE, «Minima deontica», 1988, p. 466.

[35] Amedeo G. CONTE, «Minima deontica», 1988, pp. 466-467.

of a norm is not relative to those norms on which its dianoetic validity depends, but to the constitutive rules which, *in* and *by* a legal order, condition such deontic validity.[36]

c) Deriving a *deontic truth* of a deontic sentence from its *adeontic truth* is an axiological naturalistic fallacy.[37] Referring to those divisionist contradictions about the rejection of an «ought-sentence», incompatible with a supossedly necessary transcultural law, Conte had already denied, in «Su Carcaterra» (1976),[38] an absolute nonexistence of logical relations between «is-sentences» and «ought-sentences», although that did not mean to refute those divisionist arguments, but to repose them in linguistic terms (not as division between two *worlds*, the world of «*is*» and the world of «*ought*», but as division of two moods of language: the truth (*the deontic truth*) of «*ought-sentences*» and the validity (*the adeontic truth*) of «*ought sentences*»).

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[36] Amedeo G. CONTE, «Deontico vs. dianoetico», 1986, pp. 490-491. Cf. Amedeo G. CONTE and Tecla MAZZARESE, «Regole fondate su regole», 1985, pp. 283-288.

[37] Amedeo G. CONTE, «Minima deontica», 1988, p. 467.

[38] Amedeo G. CONTE, «Su Carcaterra», 1976, pp. 101-105.

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«Counterfactuals Revisited»

COUNTERFACTUALS REVISITED

Joseph S. Fulda

A plausible theory of counterfactuals should distinguish between the following four propositions:

(1) If I am rich, then I shall tour the world.

(2) If I were to marry Lorena Bobbitt, I'd have a perfect life.

(3) If I were to marry Lorena Bobbitt, I might not have a perfect life.

(4) If I saw a ghost, I'd be afraid.

(1) and (4) are vacuously true, (2) is false, and (3) is *non*-vacuously true. Yet the standard semantics used for counterfactuals developed by Lewis and elaborated on by both him and Stalnaker, the possible-worlds account, does not distinguish between (3) and (4). As Joseph Melia has argued,[1] the ontology necessary for Lewis' theory is qualitatively unparsimonious: It «is committed to the unicorns, to the gods, to the ghosts and to the qualia which occur in other possible worlds.» That is to say, it is committed to that which in the actual world would be regarded as *im*possible. The complexity of Lewis' theory, requiring multiple quantification and spheres of possible worlds from which close possible worlds are to be picked out via the existential quantifier — a Skolem function, in effect — or via a selection function à la Stalnaker, is a direct result of the plurality of possible worlds and its qualitatively unparsimonious ontology.

In this paper, we present an alternative truth-functional semantics for counterfactuals which is (a) qualitatively parsimonious in its ontology, (b) requires neither multiple quantification nor a selection function, and (c) gets the truth values of (1)-(4) right. This semantics does not provide an adequate grounding for modal logic, where concerns of necessity and possibility are concerns of *logical* necessity and possibility, but it serves

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[1] Joseph Melia, «A Note on Lewis's Ontology,» *Analysis* 52/3 (July 1992): 191-192.

very neatly for the explication of counterfactuals and, more particularly, subjunctive conditionals.

First, let us classify counterfactuals into three groups: indicative counterfactuals such as (1), subjunctive conditionals such as (2) and (3), and what we shall call — extending a term from metaphysics — counteressentials, such as (4). We and others have already defended the case of indicative counterfactuals as a simple and defensible instance of material implication with a false antecedent.[2] A counteressential, as here intended, is any state of affairs that could not have arisen from the actual world by natural laws. Thus our ontology allows blue swans, for mutation and natural selection could have produced such, but does not allow ghosts, for there is no way for them to have arisen from the actual.

Perhaps this explication is more nearly a «possible world,» meaning one that could have arisen rather than one that can be imagined, but to distinguish our conception from Lewis' we will refer to it as a timeline. The key distinction between a timeline and a possible world à la Lewis is that a timeline is rooted in the actual world at some time in the past after which a change consistent with natural laws occurs and the result, projected into the future indefinitely, is a new timeline. It is clear that there is no timeline that could satisfy the antecedent of (4),[3] and equally clear that there are many timelines that could satisfy the antecedent of (2) and (3). (One can, for example, imagine going back and making a significant intervention during Lorena Bobbitt's childhood, among many other possibilities.) Hence,

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[2] J. Bookman, «Why 'false→false' is true — a discovery explanation,» *The Mathematics Teacher* 71 (1978): 675-676 and the correspondence thereon, *The Mathematics Teacher* 72 (1979): 405. Steven Cushing, «Material Support for Material Implication,» *Journal of Pragmatics* 18 (July 1992): 88- 89. Joseph S. Fulda, «Material Implication Revisited,» *The American Mathematical Monthly* 96 (March 1989): 247-250. Joseph S. Fulda, «Material Implications,» *The American Mathematical Monthly* 99 (May 1992): 480. Joseph S. Fulda, «Denied Conditionals Are Not Negated Conditionals,» *Sorites* 2 (July 1995): 44-45. William H. Hanson, «Indicative Conditionals Are Truth-Functional,» *Mind* 100 (January 1991): 53-72. Ronald Rubin and Charles Young, *Formal Logic: A Model of English* (Mayfield Publishing Company, 1989), pp. 95-97. C. Ray Wylie, «'False implies false' is true,» *The Mathematics Teacher* 72 (1979): 404-405.

[3] Often it will not be possible to decide what is or is not counteressential because of our imperfect and incomplete knowledge of natural laws. But we are concerned here with truth, not knowledge of truth, and if research into paranormal phenomena indicates that ghosts do or could exist, that will not touch the theory, only the particular example. As long as one grants that not *everything* could arise from the actual world via natural laws, we can accept the distinction between counteressentials and subjunctive conditionals, while conceding that there are some, perhaps a great many, counterfactuals of whose classification we may be uncertain or incapable.

if we accept indicative counterfactuals as defensible instances of vacuous truth represented by the material conditional, we can do so with equal assurance for counteressentials. The real task we face, of course, is explicating the middle case — subjunctive conditionals such as (2) and (3) which have non-vacuous truth values — and to this the remainder of this paper is devoted.

We treat subjunctive conditionals as universally general propositions[4] quantified over timelines. Thus (2) is represented $(\forall x)(Mx \rightarrow Px)$, where *x* ranges over timelines. We then treat the universal quantifier as an (implicit) conjunction of indicative conditionals (each in its timeline) and it becomes quite clear why (2) is false: At least one of its conjuncts — the indicative conditional using that substitution instance of *x* which represents the timeline in which we actually live — is false, making the conjunction and hence the universal generalization — i.e., the subjunctive conditional — false. It is also now clear why (3), represented as $\sim(\forall x)(Mx \rightarrow Px)$, is non-vacuously true: It is simply the negation of a proposition that is false, with «might not» clueing us in to its proper representation.

It remains only to show that this explication of subjunctive conditionals prevents Lewis' «counterfactual fallacies.»[5] We will not consider strengthening the antecedent here, since, as Lewis notes, it is subsumed by the transitivity fallacy, which follows:

(5) If Ronald Reagan had been born a Russian, he would have been a Communist.

(6) If he had been a Communist, he would have been a traitor.

Therefore,

(7) If Ronald Reagan had been born a Russian, he would have been a traitor.

If (5) and (6) are taken as material conditionals, we would have a sound argument with a false conclusion, a straightforward instance of the failure of transitivity. But taken as universally general propositions, we do not have a sound argument, since (6) is false, for only in some timelines in which Reagan had been a Communist would he have been a traitor.

The third and final fallacy that Lewis points out is the failure of contraposition. Consider:

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4 The idea that universally general propositions can be used to represent some conditionals originates with Russell. One example of such — in the indicative — is «If it walks like a duck, talks like a duck, and looks like a duck, it is a duck.» The «it» here is surely not pronominal (semantically), and the proposition ranges over the universe of discourse.

5 David Lewis, *Counterfactuals* (Harvard University Press, 1973), pp. 31-36.

(8) If John had gone to the party, Jane would still have gone.

Therefore,

(9) If Jane had not gone, John would still not have gone.

In the presence of (10)-(12) below, the apparently valid argument fails, since (10) & (11) makes (8) true and (11) & (12) makes (9) false.

(10) Jane likes John.

(11) John wants to go to the party.

(12) John avoids Jane.

Yet, if (8) and (9) are taken as material conditionals, the validity of the argument turns on no contingent propositions such as (10)-(12). Taken, however, as universally general propositions, we again do not have a sound argument, since there are timelines in which the instantiation of (8) is false (~(10) is a good start), making (8) itself false.

The central idea is simple enough: Instead of an existential quantifier or an explicit function, we allow natural laws to act as an implicit selection function, with the result being a mathematically cleaner, ontologically leaner, and logically keener theory of counterfactuals.[6]

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[6] Professor Michael Levin made some very helpful observations on two early drafts of this paper, as did an anonymous referee on one. The perceptive, patient, critical comments of Professor J. Michael Dunn were of central importance to this paper. Nevertheless, the idea and its development with all its deficiencies remain mine. The author would like to dedicate this essay to the memory of his beloved teacher, Dr. Arthur Spier, a man of science and learning alike.

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(2.4) Another alternative (which is in itself worse, but which nevertheless may be more practical in certain cases) is to use the DOS text format, with no character outside the range from ASCII_32 through ASCII_126, no hyphenation, a CR at the end of each line and two CRs separating paragraphs. Such files will be here called 'text files'; we expect them to bear a '.txt' extension.

(3) In cases (2.2) and (2.4) the contributor can include their paper into an e_mail message sent to our editorial inbox (<sorites@fresno.csic.es>)

(4) Before sending us their file the contributor is advised to compress it — except in case they are sending us a text file through procedure (3) above. Compression reduces disk-storage and shortens transmission time. We can extract and expand files archived or compressed with Diet, ARJ (both warmly recommended), Tar, Arc, Zip (or PKZip), GZip, Compress (i.e. .Z files), LHA, Zoo, RaR, and some versions of the MAC archivers PackIT and StuffIT.

(5) The most expedient way for contributors to send us their submitted paper is through anonymous FTP. At your host's prompt, you enter 'ftp ftp.csic.es'; when you are prompted for your username, you answer 'ftp' or 'anonymous'; when you are next prompted for your password, you answer with your e_mail address; once connected, you enter 'cd pub/sorites/incoming', then 'binary', and then 'put xxx' — where xxx is the file containing your submitted paper and a covering letter. (If the file is an archive, the extension must reveal the archiving utility employed: '.gz', '.Arj', '.RAR', etc. (DIETed files needn't bear any special denomination or mark; they will always be automatically recognized by our reading software.)

(6) Whenever a paper is submitted, its author must send us a covering letter as an e_mail message addressed to one of our editorial inboxes.

(7) If a contributor cannot upload their file through anonymous FTP, they can avail themselves of one of the following alternatives.

(7.1) If the file is a '.htm' or a '.txt' file (i.e. in cases (2.2) and (2.4)), simply include it into an e_mail message.

(7.2) In other cases, an 8-to-7 bits converter has to be used, upon which the result can also be included into an e_mail message. 8-to-7 bits convertors «translate» any file (even a binary file) into a text file with short lines which can be e-mailed. There are several useful 8-to-7 convertors, the most popular one being UUenCODE, which is a public domain software available for many different operative systems (Unix, OS/2, DOS etc). Perhaps the most advisable at this stage is PGP ['Pretty Good Privacy'], which also allows authentication (signing). Another good such convertor, very easy to use, is Mike Albert's ASCIIZE. We can also decode back into their binary original formats files encoded into an e-mailable ASCII format by other 8-to-7 bits convertors, such as: Mime, TxtBin, PopMail, NuPop, or University of Minnesota's BINHEX, which is available both for PC and for Macintosh computers. Whatever the 8-to-7 bits encoder used, large files had better

[2] At our home site, **ftp.csic.es**, there is — hanging from our main directory **/pub/sorites** — a subdirectory, **WWW**, which, among other files, contains one called 'HTML.howto', wherein the interested reader can find some useful information on HTML editors and convertors.

be previously archived with Arj, Diet or any other compressor, the thus obtained archive becoming the input for an 8-to-7 bits convertor.[3]

(7.3) An alternative possibility for contributors whose submitted papers are WordPerfect 5.1 or WordPerfect 6 docs is for them to use a quite different 8-to-7 bits convertor, namely the one provided by the utility Convert.Exe included into the WordPerfect 5.1 package. (WordPerfect corporation also sells other enhanced versions of the convertor. WordPerfect 6.0 has incorporated a powerful conversion utility.) A separate e_mail message is mandatory in this case informing us of the procedure. The result of such a conversion is a 'kermit-format' file.[4]

(8) You can also submit your manuscript in an electronic form mailing a diskette to the Submissions Editor (Prof. Prof. Manuel Liz, Facultad de Filosofia, Universidad de La Laguna, Tenerife, Canary Islands, Spain). Diskettes will not be returned.

(9) Such submitted papers as are neither WordPerfect 5.1 files nor files in HTML format require some preparation.

(9.1) Ours is not a logic journal, but of course one of the glories of analytical philosophy is its rigour, which it partly owes to auxiliary use of symbolic notation in order to avoid ambiguities, make matters of scope clear or render arguments perspicuous. ASCII translations of symbolic notation are problematic, especially in cases of nonclassical logics, which may use sundry negations, disjunctions, conjunctions, conditionals, implications and also different universal and particular quantifiers (e.g. existentially and nonexistentially committed quantifiers, a familiar dichotomy in Meinongian circles). While using WordPerfect 5.1 you can represent a huge variety of such nuances, it is impossible to express them within the narrow framework of text or even ASCII files (i.e. even when the 224 printable [extended] ASCII characters can be used). Still, for some limited purposes, a translation of sorts can be attempted. You are free to choose your representation, but the following translation is — for the time being — a reasonable one: '(x)' for universal quantifier, '(Ex)' for existential quantifier; '&' for conjunction; 'V' for disjunction; '->' for implication (if needed — something stronger than the mere 'if … then'); 'C' for conditional; '=>' for an alternative (still stronger?) implication; '_pos_' for a possibility operator; '_nec_' for a necessity operator.

(9.2) In ASCII or text files all notes must be end-notes, not foot-notes. Reference to them within the paper's body may be given in the form '\n/', where n is the note's number (the note itself beginning with '\n/', too, of course). No headings, footings, or page-breaks. In such files, bold or italic bust be replaced by underscores as follows: the italized phrase '*for that reason*' must be

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3 For the time being, and as a service to our readers and contributors, we have a directory called 'soft' hanging from our home directory /pub/sorites at the node ftp.csic.es. The directory contains some of the non-commercial software we are referring to, such as archivers or 8-to-7 encoders (or 7-to-8 decoders).

4 In the case of WordPerfect 5.1, the procedure is as follows. Suppose you have a file called 'dilemmas.wp5' in your directory c:\articles, and you want to submit it to **SORITES**. At your DOS prompt you change to your directory c:\articles. We assume your WordPerfect files are in directory c:\WP51. At the DOS prompt you give the command '\wp51\convert'; when prompted you reply 'dilemmas.wp5' as your input file whatever you want as the output file — suppose your answer is 'dilemmas.ker'; when prompted for a kind of conversion you choose 1, then 6. Then you launch you communications program, log into your local host, upload your file c:\articles\dilemmas.ker using any available transmission protocol (such as Kermit, e.g.). And, last, you enter your e_mail service, start an e_mail to to <sorites@fresno.csic.es> and include your just uploaded dilemmas.ker file into the body of the message. (What command serves to that effect depends on the e_mail software available; consult your local host administrators.)

With WordPerfect 6 the conversion to kermit format is simple and straightforward: you only have to save your paper as a 'kermit (7 bits transfer)' file.

represented as '_for that reason_' (NOT: '_for_that_reason_'). A dash is represented by a sequence of a blanc space, two hyphens, and another blanc space.[5]

[5] Those devices are temporary only. Later on we'll strongly advise and encourage those of our contributors who can use neither WordPerfect format nor one of the other word-processor formats our convertors can handle automatically to resort to HTML, with certain conventions in order to represent Greek characters as well as logical and set-theoretic symbols.

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[1] The reader may find an excellent discussion of copyright-related issues in a FAQ paper (available for anonymous FTP from rtfm.mit.edu [18.70.0.209] /pub/usenet/news.answers/law/Copyright-FAQ). The paper is entitled «Frequently Asked Questions about Copyright (V. 1.1.3)», 1994, by Terry Carroll. We have borrowed a number of considerations from that helpful document.

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This issue of **SORITES** is made available in several formats, but its only official version is that released with filename:

sorite05.wp5

which is the only file within the archives: **sori05wp.zip**, **sori05wp.arj**, **sor#05wp.gz**, etc. A print-file (**soriti05.ps**), also released, and generated from the file **sorite05.wp5** can be found in the archive **sori05ps.zip** and printed with a PostScript printer.

Two whole «doc» versions of this issue of **SORITES** are provided, but they cannot truly or faithfully reflect the official WordPerfect 5.1 version, departing as they do from the authorized WP 5.1 document — in a more or less severe way, depending on the particular case. One of them, **sorite05.html** (or its equivalent, **sorite05.htm**), is an hypertext HTML version chiefly destined to be desplayed at the InterNet Web and viewed with http browsers. The other, **sorite05.txt**, is an empoverished version, with only ASCII symbols <Alt-32> through <Alt-126> being used, and a CR at the end of each line. Those two versions are archived, respectively, as **sor05htm.zip** and **sor05txt.zip**.

Several of those files are made available in UUenCODed (.UUE) and BinHexed (.HQX) translations, in order for them to be attached to e-mail messages.

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