'The problem itself persists': Problems as *Missing Links* between Concepts and Theories in Canguilhem's Historical Epistemology

Thomas Ebke

If one was to register the specific terminological use of the concept of the 'problem' in 20th century philosophy of the sciences and of scientific practice, it is not without a soupçon of irony that one would have to compile such an inventory. Without a doubt, or so Warren Weaver claimed in 1948, a formalised mathematics of the kind that had propelled the regime of stochastics and statistical mechanics about half a century earlier would hold the key to unlock so-called 'problems of disorganized complexity' (Weaver 1948: 538), that is to say logical situations involving a vast amount of variables, all of which display 'individually erratic' (ibid) characteristics. Conundrums of that type, Weaver argued, will turn out to be more complex to manage than 'two-variable' (ibid: 537) problems – which conveniently correspond to the binary system of the mathematics of mechanics – but it is through the recurrence of 'certain orderly and analyzable average properties' (ibid: 538) that, despite the numeric range and largely random interplay of the variables, predictions as to their standard distribution will hold true 'with increasing precision' (ibid). The reason for the relative controllability of such a system of randomly interconnected, yet homogeneous, elements is the 'disorganized complexity' of the ensemble, that is the absence of an internal *order* – an organised configuration of the components that would be irreducible to a recurring pattern of averages. As opposed to these two classes of problem constellations, 'problems of simplicity' (which can be addressed by the mathematics of mechanics) and 'problems of disorganized complexity' (mastered by stochastics), then, Weaver identifies a third type of problem that displays

a strict quality of intrinsic organisation, an 'organic' (ibid: 539) immanence of the ensemble that obliterates any random conduct of its elements.[1]

Indeed, the hiatus between the logic of 'disorganized complexity' and the quality of what Weaver dubs problems of 'organized complexity' constitutes the most interesting moment within Weaver's argument: after all, the distinction between these two classes of difficulties is not based on the sheer numeric excess of the variables (which, in turn, is precisely the distinguishing mark between 'simplicity' and 'disorganized complexity'). The leap from 'disorganized' to 'organized' complexity is not tied up with an increase in the amount of empirically contingent factors that would, at one point, become impossible to prognosticate. On the contrary, the very fact that an excessive number of variables interact in empirically random constellations makes it all the more possible to single out regularities within that state of contingency and to numeralise the likelihood of recurrent events (such as, in Weaver's example of telephone communication, 'the average frequency of calls, the probability of overlapping calls of the same number, etc.', ibid). Paradoxically, it is rather the blanket extinction of empirical randomness in a system of 'organized complexity' that prevents the forecast of the conduct of its parts (and of itself, in its integrity) by means of statistical calculation. Thus, Weaver can raise the following questions that, in his account, deserve to be tackled under the label of organised complexity: 'What makes an evening primrose open when it does? [...] Why can one particular genetic strain of microorganism synthesise within its minute body certain organic compounds that another strain of the same organism cannot manufacture? Why is one chemical substance a poison when another, whose molecules have just the same atoms but assembled into a mirror-image pattern, is completely harmless? [...]' (ibid: 539). It is, of course, not insignificant at all that these textbook examples of organised complexity, which exhibit the irreducibility of 'the whole' towards the sum and the qualities of its components, stem from the world of vital phenomena – from the horizon of 'life'. In 1948, Weaver resumed Kant's hint at the peculiar teleological constitution of organisms – or

1 Weaver marks off this set of problems from the situation of 'disorganized complexity' with recourse to the stochastics of the billiard game: 'For example, the statistical methods would not apply if someone were to arrange the balls in a row parallel to one side rail of the table, and then start them all moving in precisely parallel paths perpendicular to the row in which they stand. Then the balls would never collide with each other nor with two of the rails, and one would not have a situation of disorganized complexity' (Weaver 1948: 538).

rather, which is, in fact, a decidedly different claim, at the way in which 'our' finite intellect inevitably judges 'organized nature' (Kant) as if it is the abode of an intrinsically teleological organisation. This specification is crucial as Weaver, abandoning the Kantian axis of reasoning, expresses his optimism that the ongoing 'advance' (ibid: 541 and passim) of the natural and technical sciences will in the end bring about empirical techniques to determine and regulate states of organised complexity. Whereas Kant had categorically severed the teleological access to the self-sufficiency of organic living beings from the mechanistic approach – which, inadequately, refers to the purposeful entirety of the organism as a totality of *partes extra partes* – Weaver clearly opts for an investment into the future progress of the natural sciences and the regime of their techniques of regulation until they will one day be able to respond to the specific intricacy of organic, that is to say emergent, forms of organisation. However, this positivistic reduction of the singular epistemic status of living phenomena (as elaborated by Kant) will not garner any systematic attention in the following analysis: this reduction is classical in its own right, and its critique can scarcely dispense with the worn-out dualisms of philosophical (or, for that matter, phenomenological) description versus empirical objectification, 'philosophical' versus 'scientific' discourse, heuristic 'openness' versus methodical 'closures' etc.

Rather, it is pertinent to take note of and to reflect on the way in which the terminology of 'problems' is tied up, at this particular juncture, with the notion of, or at least with an allusion to, the irreducible dimension of *life*. If one traces the history of the term 'problem' back to its conjuncture in 19th century philosophy and sciences, it is intriguing to learn that this particular term – as opposed, for instance, to the semantics of 'concepts' – was meant to address a delicate entanglement between the order of *objective* contents (problems as 'matters of fact') and the pole of the *subject* of scientific inquiry. To 'throw up' (see the origin of the word προβάλλειν: 'to throw something up in front of yourself') a problem amounts to irreplaceably 'having' a problem, to be, as it were, embroiled in and practically affected by the particular difficulty that poses itself. In the German tradition, Nietzsche and Simmel stand out in their emphatic pronunciation of this involvement of the subject that raises the problem *in* the problem, in defiance of the Neo-Kantian current that, during their time, identified 'problems', on the contrary, as technically specified tasks within an already established context of scientific discourse (see, for instance, the position of Richard Hönigswald, cf. Hönigswald 1931).

The summary of this specific panorama – in which problems appear on the threshold of an epistemic process that includes them in the immanence of a scientific discourse, while at the same time they remain expressive of the living subject who pursues problems, the subject to whom problems matter – sets the stage for the argument that I wish to carry out in this article. It will be my goal to show that the philosopher and historian of science Georges Canguilhem (1904-1995) elaborated a conceptualisation of what *problems* are that demarcates their role in the research process from two other elements that are also at stake in the very same process: namely, on the one hand, *concepts*, and, on the other hand, *theories*. Problems emerge and remain, as it were, on the threshold of a series of operations that bring about the specific discourse of a science, including the set of epistemic objects with which that discourse correlates. Both complementary terms, concepts and theories, need to be located within this immanence of science: it is here that they fulfill their specific functions. Yet, to the extent that concepts never fully coincide with and never entirely cover the scope of what problems are, the latter retain a quality of resistance to the conceptually restrained fabric of a science. Indeed, they point back to the *enjeu* of a vital subjectivity that initiates research processes in the first place and, in so doing, undergoes a shift of position that transforms it, the living entity, itself into an object of the sciences.

In a nutshell, the thesis around which my observations will revolve is the following: if one wishes to understand the concise status of what features as a 'problem' within Canguilhem's version of historical epistemology, one needs to explicate a triad of terms, namely the way that problems are intertwined both with 'concepts' and with 'theories' – more precisely, with scientific theories. It is only in establishing links and distinctions between these three elements and in insisting on their non-coincidence that the following argument can be upheld: according to Canguilhem, the epistemological pertinence of the problem and its fecundity within the process of the constitution of a scientific discourse harks back to the way in which a problem *outlives* or *outlasts* its conceptualisation, that is to say, the way in which it outlives the *concept*. In that sense, problems act as *missing links* between concepts and theories within the process of the formation of a science. However, Canguilhem does not at all argue that the epistemological effect of the problem is to provide the inaugural piece in the genesis of a scientific discourse that could in the end be considered as self-sufficing, immanent and complete. Rather, it is Canguilhem's very distinction of problems as opposed to concepts *within*

the dynamism of conceptualisation proper that enables and motivates him to mount a critique of scientism precisely by insisting on the *historicity* of the generation of scientific discourses. It is against the background of these distinctions that Pierre Macherey echoed Canguilhem's famous definition of philosophy as the 'science of solved problems', *la science des problèmes résolus*, as Canguilhem phrased it in his study on the formation of the concept of the reflex in the 17th and 18th centuries (Canguilhem 1955). On Macherey's reading, the 'philosophie du concept' pursued by Canguilhem constitutes '*la science des* problèmes indépendamment de leur solution' (Macherey 2008: 56). This expression, after all, hits an insight that seems to be deeply characteristic of Canguilhem's historical epistemology in its entirety, that is the insight that *philosophy* addresses an element – namely problems – which is elaborated, as it were, from the inside and within the boundaries of a science, yet without reproducing and sharing the very means that science summons up in coming to grips with that certain problem: those means being the concepts of science. It seems helpful to reiterate the gist of these observations: although Canguilhem locates philosophy *immanently*, at a point that finds itself in the midst of the very operations of scientific rationalisation, he does so only to explicate a sharp split between philosophy and science. Philosophy, for Canguilhem, presents itself as 'a science of problems' in such a way that the problems (re-) appear in their independence from the solutions that scientific discourses have endowed them with. Indeed, it is crucial to underscore the verb *reappear* at this juncture and to draw attention to its temporality: to return to the problems that had been at stake at the outset of a process of scientific conceptualisation is in itself a historical procedure whose effect it is to reinstate what has (already) been 'framed', that is to say operated on and thus rationalised by means of scientific concepts. One would not be entirely misled if one concluded that Canguilhem restores on the part of the objects of science what, in an inevitable reduction, had been taken (that is: *abstracted*) from them in the very process that turned them into epistemic objects in the first place – namely their problematic status, their quality as problems according to which they remain specifically external to the concepts that relate to them and express them under the conditions of science. What Canguilhem dubs a 'historical epistemology' is thus a decidedly philosophical undertaking while, at the same time, his conception of philosophy takes on the irreducible form of an epistemology that cannot but proceed historically.

In what follows, I will attempt to elaborate the point that historical epistemology, in Canguilhem's definition, is a type of reflection that situates itself at the crossroads of the history of science and a philosophy of values: in a certain discord with the wording used by Macherey, I will suggest thinking of this epistemology not as the *science* of 'problems independent of their solutions', but as a reciprocally historical and philosophical gesture that separates the *problems* of scientific rationalisation from their *conceptual* and *theoretical* solutions, which is precisely what the sciences engender. In an inaugural step, however, it will be crucial to expound the specific genealogy and meaning the term 'problem' takes on in the writings of Canguilhem.

The epistemological dispositive of Canguilhem's problematology: the fissure between *protasis* and *problem*

In his biography on Michel Foucault, Didier Eribon portrayed Georges Canguilhem as a clandestine intellectual who, although constantly looming but in the *background* of a scenery that boasted more flamboyant protagonists (such as Foucault himself), obliquely shaped the entire agenda of philosophical discussions in France in the 1950s and 1960s (Eribon 1989: 232). According to Eribon, the key antagonism that remained at work underneath the major controversies of these decades was the split between, on the one hand, Canguilhem, and on the other, Jean-Paul Sartre. Thirty years after Eribon evoked that picture, at a time when Canguilhem was still alive, it is fair to say that this philosopher has been elicited from the relative obscurity that surrounded him *à l'époque*. The systematic reception of Canguilhem's thought can be rather neatly traced back to 1996, which witnessed the publication of Gilles Renard's monograph on Canguilhem's rendition of historical epistemology (Renard 1996). In the aftermath of this rediscovery, one axis of reception that has been particularly prominent is a line of research that inscribes the project of Canguilhem into a 'Bergsonian' heritage (see Osborne 2003, During 2004, Worms 2009, Schmidgen 2014, Delitz 2015). According to this reception, Canguilhem's notions of the normativity of life and of the primacy of practice within scientific inquiry are strongly tied to the modern vitalism of Henri Bergson, who stands aloof in the landscape of 20th century French philosophy due to his singular insistence on a philosophy of life.

The emphasis on Canguilhem's 'Bergsonian' filiation has exerted an interesting impact on contemporary readings of Canguilhem. By and large, Canguilhem's specific tackling of the question of what problems actually are has been reduced to the Bergsonian claim that 'genuine problems demand the creation of the concepts that will be used to posit them' (Bowden 2018: 48). On that reading – which certainly has its merits – the decisive point is the practical quality and efficacy of problems, which, rather than being the mere correlates of scientific practice, essentially engender the techniques, including the conceptualisations, that science requires in order to (literally) come to terms with 'its' problems (ibid). But it would be a cliché to associate Canguilhem's understanding of problems too tightly with this 'Bergsonian' trajectory, which cannot but amount to the idea of a radical primacy of life over and against its objectifications via science. Instead, it can be helpful to note that what seems to linger in Canguilhem's vocabulary of 'the problem' is a decidedly *Aristotelian* echo: in view of the logical issue of problems in his *Topics*, one can identify at the centre of this tract the motion of dialectical reasoning (see Margel 1997: 160-162). Aristotle, in fact, makes a distinction between πρόβλημα and πρότασις: the first term, the problem, represents that *upon which* (τά περι ων) a dialectical train of arguments is grounded: that which is thrown up in the logical form of disjunction. The second term, by contrast, refers to that element *out of which* (τά ἐξ ών) he who draws the logical conclusion can base the dialectics (see ibid for this entire reconstruction): that is, in the sense of the classical syllogism, the premises. In other words: the protasis is the active heuristic operation that takes root in what, in logical priority, had been thrown up before *the one who constructs the dialectical argument*. That is to say, technically speaking, the premises of a dialectical construction take on the *form* of the premise only by means of a (protatic) reply to a (problematic) question, that has, in logical antecedence, been raised and posed, thereby eliciting the dialectical motion of arguments.

At first glance, it might be difficult to discern the point of interest that is at stake here: if a fissure constantly remains between the problem that is brought up – or rather, 'projected' (ibid: 170) – in a proposition and the *protasis* which takes up that very problem under the form of syllogistic premises, then this transition crucially implies a discursive 'space of controversy' (ibid: 169: 'espace d'une controverse') in which interlocutors confront each other as adversaries. In a first step, this internally polemical or controversial structure explicates itself to the extent that a problem does not simply coin-

cide with any enunciation whatsoever; rather, it is precisely an enunciation constituted in a form that is open to discussion: 'Ought one rather to obey one's parents or the laws, if they disagree?' (Aristoteles 1984: 176). In other words, the problem suspends any reference to facticity by turning a presumed fact into a moot subject, a question that elicits logical reasoning on behalf of the interlocutors. On a second level, this enunciation that has shifted into the status of a problem invites a multiplicity of heterogeneous (rational, conceptual) solutions, including the acknowledgment (or the denial) of the *problematic status of that which has been thrown/brought up* – that is to say, of the πρόβλημα itself. The fissure between and the passage from problems to premises, then, is intrinsically polemical, it is permanently open to discussion. Yet, it would be justified to speak of a genuine Aristotelian 'dialectics of problems' (cf. Marge 1997), because what unites the problem with the premise(s) and what in fact transforms the problem into the premise through the operation of πρότασις is the logical form of interrogation. By posing the problem in the form of a question to the interlocutor binds the one who asks and the one that is called upon to answer to the discursive standard of the *judgment*. It is the interpellative function of interrogation that guarantees the formal connection of the problem and the premise, the projection and the proposition (see ibid: 173-174).

This recourse to Aristotle's *Topics* might in fact be conducive to an adequate reading of the systematic role played by the term 'problem' within Georges Canguilhem's historical epistemology. At least *one* impact that I hope my observations in this paper may induce rests in the claim that, in opposition, or rather as an amendment to, the Bergsonian interpretation of Canguilhem's 'philosophy of the problem', one should elaborate on the intrinsically epistemological dimension, that is to say, on the Aristotelian vein of Canguilhem's interest in *problems*. According to Aristotle, the eminent logical function of problems hinges upon the 'dialectical' quality of their logical solution, which transposes the discussion of the problem into the twofold form of interrogation and, as its correlate, judgment. In the secondary literature on Canguilhem, which, in some sort of pragmatist reflex, too frequently focuses on the vital(-ist) foundation of the semantics of problems, anchoring it in Bergson and/or Bachelard as Canguilhem's major sources, this epistemological dispositive tends to be underestimated (see During 2003, Osborne 2003, Schmidgen 2014, Feldman 2016, Bowden 2018). Yet, to overlook this dispositive would mean to fall short of the argument over why Canguilhem's

project of historical epistemology is an intrinsically political and in itself a normative intervention. Before this position can be spelt out in more detail, however, it is indispensable to go back to at least two of the most prominent quotations from the writings of Georges Canguilhem that foreground the notion of the 'problem.'

Theories, concepts, problems

In one of the most famous wordings from his magisterial study *The Normal and the Pathological* (1943), a passage that stems from the original introduction to the book, Canguilhem underscores that the reason why he studied medicine in the first place and later earned a doctorate in that discipline was his expectation that medicine might 'provide precisely an introduction to concrete human problems' (Canguilhem 1978: 6). This quotation, as well as the one that follows, lends credence, all in all, to what one might apostrophise as the *vitalist* key to reading Canguilhem: on this view, problems designate an objectivity that is dealt with by a scientific discourse, yet in that grasp outlasts the very rationality of such a discourse, which cannot but be based upon an interplay of concepts and a theory that guarantees their coherence. A problem seems to represent a difficulty of an intrinsically *technical* register – an underlying issue that propels the immanent 'solutions' generated by a science, while at the same time outwearing any such termination. It is, of course, not by accident that this distinction is evoked by Canguilhem in the direct context of a reflection on the normativity of the living organism as a factor that thwarts its full objective explication within a scientific physiology. More concretely, at one moment in his book Canguilhem tackles the question of whether Claude Bernard expressly intended, in the formulation of his own physiology, to blur the strong, qualitative idea that the pathological states of the organism are in themselves genuinely normative states that are irreducible to the states and conditions of the 'healthy' organism. Tending to credit Bernard with exactly such a strategy, but at the same time with a certain hesitation as to the legitimacy of such a suspension, Canguilhem continues with the following interesting remark: 'This ambiguity is certainly instructive in that it reveals that the problem itself persists at the heart of the solution presumably given to it. And the problem is the following: Is the concept of disease a concept of an objective reality accessible to quantitative scientific

knowledge? Is the difference in value, which the living being establishes between his normal life and his pathological life, an illusory appearance which the scientist has the legitimate obligation to deny?' (ibid: 36).

Problems, Canguilhem contends here, 'persist at the heart of the solution' they have been endued with; that is to say, a problem outlasts the conceptual operation which does not only raise the problem but, in so doing, renders it intelligible. However, it would be mistaken to envisage this deferral of concepts vis-à-vis the problem as a purely derivative relationship (as if the concepts of a science cannot but fall short of their underlying problem): instead, it is equally important to recognise that problems, rather than existing aloof from scientific rationality, always appear on the threshold of a science, permanently on their way to a science's immanent nexus of a theory and its concepts. Now, a close examination of the secondary literature on Canguilhem's problematology (see sources above) demonstrates that most readings of his disjunction between problems and concepts stop at the 'vitalist' conclusion and its twofold logic. At any rate, the vitalist reading of the way Canguilhem winnows problems from concepts does not only accentuate the role of the problem as a technical obstacle within the discourse of science, but also identifies *life* as the epitome of any productive (viz. normative) force that defies all positivisation. Thus, by definition, life features *par excellence* as the intrinsically generative process of the 'formation of forms' (Canguilhem 2008: XIX): Whereas the analytic determinations brought about by the discourse of science cannot hold good but for the terminal forms of vital processes, life comes into view as the formative process itself from which all those forms originate. Therefore, the primary mode in which the specificity of life as an intrinsically normative phenomenon becomes expressive is the mode of *techniques* (ibid).

It will be my core observation in this paper, however, that in terms of a corrective or, as it were, an amendment to this vitalist stance, one ought to reevaluate the Aristotelian legacy in Canguilhem's appropriation of the semantics of the 'problem'. This legacy provides Canguilhem's approach to the sciences with a fully fledged *political epistemology* that revolves precisely around the fissure between πρόβλημα and πρότασις: the latter term representing an active reply to an antecedent *problematic* question that can or cannot subsequently be carried out in the logical form of the premise. Xavier Roth (Roth 2013) has recently drawn attention to the lineage in Canguilhem's thinking that connects his approach with the (French) 'style de pensée ré-

flexif' (ibid: 129). Among the most renowned protagonists of this intellectual current, Jules Lachelier (1832-1918), Léon Brunschvicg (1869-1944) and Émile-Auguste Chartier aka 'Alain' (1868-1951) stand out, and Roth gives a helpfully concise idea of what is central to the philosophical tradition of the *analyse réflexive*: this tradition essentially represents an epistemology which insists on the irreducibility of values to facts and on the perpetual challenge to the human spirit to elude the reign of facts by the very acts of judging their genesis and validity (ibid: 130-131). 'Reflexive analysis' thus designates the bending back (*re-flexio*) of the fact to its intrinsic axiology, to the judgmental, that is to say evaluative operations that are sedimented in 'matters of fact'. Nowhere has Canguilhem spelt out the methodology of his 'reflexive analysis' of the sciences more clearly than in his early *Traité de Logique et de Morale*, co-written with his colleague Camille Planet in 1939, when both authors were employed as teachers of philosophy at a *lycée* in Toulouse. It is in this treatise that Canguilhem gives the following portrait of science as a rationale of substituting practical obstacles with (temporary) inconsistencies on the level of discursive conceptualisation: 'Toute science est analyse des *obstacles* que l'existence supposée d'une Nature dresse dans l'expérience devant nos désirs; pour le jugement théorique qui a ainsi *décidé* de se constituer, l'échec prend la form examinée plus haut, celle de l'erreur, en se considérant uniquement comme affirmation de réalité reniée par l'objet même.' (Canguilhem/Planet 2011: 653)

The quintessence of this wording is sufficiently explicit: the discourse of science hinges upon an epistemological *decision* to confront practical impediments as immanent issues within a process of conceptual rationalisation. What is more, it is not by accident that Canguilhem takes up the role of *judgments* in this context: on a first level, judgments are located within and effectuated by the scientific discourses themselves. It is in the interest of the consummation of the scientific practice to treat technical obstacles, bluntly speaking, as immanent moments of the working of the concept. Yet, on a second level, there is also a historical judgment at work here, that is to say the evaluation of the historian of science who judges the judgments of the scientists themselves. It is this twofold gesture which, as far as I can see, structures Canguilhem's idea of 'reflexive analysis.' Another quotation from the *Traité* corroborates Canguilhem's 'pre-vitalistic', reflective starting point of a genuine philosophy of the problem: '[Q]uand nous commençons de dissocier le chaos perceptif en y cherchant des "genres" de choses, nous

sommes amenés, pour comprendre les choses les unes par les autres, à multiplier non seulement ces genres, mais les "points de vue" sous lesquels ils nous *apparaissent* et nous constituons ainsi des *concepts*. [...] Les concepts pris tels quels ne sauraient être des vérités; au même titre que les sensations, et bien que formés d'autre manière, ils proposent des *problèmes* à qui essaie des les comprendre et pour cela des les ordonner.' (ibid: 721)

This is a particularly rich quotation that needs to be unpacked with some caution, not least because it eventually helps to elucidate the division between *problems*, *concepts* and *theories*. To begin with, on inspection of this quote, it seems that two different ways to understand what a 'concept' does or is can be ruled out on its basis (viz. Schmidgen 2014). On the one hand, concepts do not represent reality; they have no semantic and no referential function. But on the other hand, neither can they be adequately interpreted as 'constructions' (ibid: 238), not even in Kant's gentler, decidedly non-constructivist sense of a priori determinations of thought that are, in the last instance, anchored in the transcendental apperception of consciousness. Rather, as both Canguilhem's and Planet's choice of words and their reading by Henning Schmidgen suggest, concepts normatively *make* something *visible*, they 'produce realities and perceptions, and stimulate activity' (ibid). A concept seems to inscribe into the phenomenon it addresses a distinct 'point of view', a distinctive operation that imposes a normative decision on the one who approaches the phenomenon via this concept, such as a researcher in an empirical situation of a scientific practice. As a textbook example, one might think of the concept of the reflex and the way that it necessarily involves an elementary opposition, namely the opposition between voluntary and involuntary movements. After all, the productive performance of the concept consists of the way it raises or proposes a problem – to take up Canguilhem's and Planet's expression here. Importantly, the two young authors continue to argue, on the following page of their treatise, that concepts, in this light, indeed already imply 'connaissance' (Canguilhem/Planet 2015: 722) – which I hesitate to translate here with 'knowledge' – but precisely not 'connaissance *vraie* ou scientifique' (ibid). After all, then, one seems to be justified in pointing out that concepts are on the road to more precise knowledge. Yet, what keeps a concept aloof from 'connaissance' in the strict sense is that it does not, in and by itself, generate an internally coherent system of judgments that explicitly order and classify the phenomena under the perspective that this particular concept is able to open up. In other words concepts supply a

sketch of the solution which they tend to give to the specific problem that correlates with them. But here comes what Canguilhem and Planet add to their portrait of what, in their book from 1939, a concept is: 'C'est que, de la subjectivité impliquée dans l'expérience originelle, les concepts gardent une sorte de contingence, et même une instabilité: tel pense inoffensif ce que tel autre juge dangereux, durable ce qui celui-ci croit précaire, etc.' (Canguilhem/Planet 2015: 794)

This is indeed a salient point in Canguilhem's entire conception of epistemology: on a level that is not already included in the immanence of the theorematic operations of a science, concepts continue to implicate a *contingency*, or, as the quotation has it, a precarious openness – and this contingency is precisely the share of the *problem*. No ultimate determination of the problem that is at stake in connection with a specific concept can ever be reached, and while concepts seem to invite and elicit research that is conducted under the genuine conditions of science – that is, within a discourse that aims at producing or speaking 'the truth' – they are never fully reducible to the realm of science. At this juncture, it is no longer complicated to discern the disjunctive operation that culminates in the slip between problems and concepts. The reason for this fissure is the internal tension between πρόβλημα and πρότασις: the transition from problems to premises always rests upon a normative act (the πρότασις), an implicit act of judgement that decides to accommodate the problem inside a conceptual regime. And it is precisely the flip side of this operation that Canguilhem (alongside Planet) calls to mind with his usage of the term 'problem': to remit the discourse of science to its *problems* as opposed to its concepts amounts to unveiling the normative judgments, and the historicity of these judgments, that structure the discourse of science itself. In other words, the recourse to the problem is the key to that 'reflexive analysis' which explicates the epistemic decisions of a science and, in so doing, itself judges those decisions as historical *enjeux*.

In his paper on the topic, Henning Schmidgen contends that whenever Canguilhem speaks of a 'concept' in the technical sense, there is always an interplay between a phenomenon, a denomination and a definition at work (Schmidgen 2014: 246). For example, while we encounter the word 'reflex' in the sense of a *denomination* in the writings of Descartes, it is not the case that this word carries with it a fully fledged *definition* of the object it addresses. In fact, as Canguilhem shows in his study about the formation of the concept of the reflex in the 17th and 18th centuries (Canguilhem 1955), Descartes did

not conceive of a homogeneity between sensory stimulation and motor reactions, whereas in the latter half of the 17th century, notably in the writings of the British physician Thomas Willis, it is exactly the functional symmetry of these two cycles that is conceptualised, that is to say determined as a reflection, a reflux, or an echo, by means of the word 'reflex'. Only then does the word 'reflex' take on the terminological function of a 'concept': it begins to address the phenomena of voluntary and involuntary motions under a qualitative distinction between these two groups of phenomena. In other words, it classifies and stabilises experience through the lens of this distinction.

Pierre Macherey has drawn rich conclusions from this methodology in Canguilhem's writings. The following quotation from his above-mentioned piece on Canguilhem's philosophy of science speaks for itself: 'Un *concept*, c'est un mot plus sa définition; le concept a une histoire; à un moment de cette histoire, on dit qu'il est formé: quand il permet d'instituer un protocole d'observation' (Macherey 2009: 59). One can retain the idea that concepts have a history only to the extent that one speaks of something that might have been, and can always be, conceptualised in ways and terms different from the path that a science historically took as a matter of fact. This factor is precisely what Canguilhem has termed, on more than one occasion, a *problem*. However, one needs to be concise on this point: the notion of the problem is not part of a position that one might describe as an epistemic realism. Problems are no realities that would exist outside of and preceding the work of conceptualisation. In this regard, Canguilhem is very outspoken and he sides with Duhem, Rey and Bachelard in saying: 'Le fait n'est pas ce dont la science est faite, mais ce que fait la science en se faisant' (Canguilhem 2015: 371). Thus, the difficulty in coming to terms with the role of *problems* as opposed to *concepts* in Canguilhem's epistemology resides in the fact that Canguilhem does indeed separate these two poles, but that does not mean that he grants the problem an ontological status anterior to the process of conceptualisation. Strictly speaking, then, problems are not phenomena. Rather, a problem is a specific task that a conceptual operation tosses up in front of itself as something which requires a solution – which is supposed to need a solution that is not yet, or may be no longer, in place. All of this is particularly relevant under the aspect of time, in the perspective of temporality: although Canguilhem aims at explicating *that* dimension which presents itself, after all, as exterior and irreducible to science, he does not at all pursue the direction of a phenomenology of lived experience, and to some extent he does

not even (strictly) associate this dimension with his philosophical vitalism. What one needs to understand, then, is the immanent critique of scientific rationalities, a project that, by the way, does not exclude, but rather implies the affirmation of the peculiar normativity of the sciences. In the last step of my argument, I will briefly try to betoken the fabric of Canguilhem's historical epistemology in its 'pre-vitalist' configuration that is not yet, at least not explicitly, pervaded by the argument of biological normativity, but rather oriented towards the 'reflexive analysis' of the *problems* of science.

The upshot of the reflexive analysis: moments of stability, moments of crisis

Pierre Macherey has reminded us of something pertinent, namely of Canguilhem's claim that concepts are actually *born* (Macherey 2009: 58). Therefore, what needs to be reconstructed are the constellations and the normative choices, the *enjeux* which have a hand in the birth of a concept. The temporality of the concept does not coincide with the history of a scientific discourse or of any scientific discourse which operationalises that concept. In order to fully account for this non-coincidence, one would have to earmark three breakages which a historical epistemology in the lines of Canguilhem deals with and draws our attention to. The first breakage is the irreducibility of problems to concepts: concepts tackle problems through an act of πρότασις, thus transforming them from technical obstacles into the immanent subject matter of scientific rationalisation. It is on this level that Macherey can introduce the idea of philosophy as a questioning of problems in their independence from their solutions. The second breakage concerns the way that scientific discourses implicate problems in a theorematic regime. In this perspective, Canguilhem insists, as Macherey has justly shown, not only that a theory has its moments of crisis, but actually even a *birth*, the birth of the theory being the decision of science to tackle problems conceptually, driven, as it were, by something that one might call a *volonté de la vérité*, a will to produce and to speak truth. Thirdly, however, there is another breakage, which, too, has to be reconstructed historically, and that is the point where science spills over to arenas that are outside of science per se, for instance, to the field of techniques as opposed to science. The example of the rise of positivist

physiology, which has eclipsed the genuinely technical and practical dimension of medicine, is particularly telling in this respect.

And one finally begins to understand, too, that this philosophy is intrinsically tied to and can only constitute itself as a history of science. Philosophy raises and highlights problems in a gesture that is not driven by the will to solve them, by the *volonté de la vérité* that is immanently constitutive of science. On the contrary, philosophy solicits a precise historical reconstruction of the distinct ruptures and normative stakes in the process of formation of scientific knowledge. To understand what is at stake here, a glimpse at the philosophical articulations of 'Canguilhem avant Canguilhem' (J.-F. Braunstein) can be particularly precious: it is here that the epistemology of reflexive analysis is foregrounded, an operation that lingers on the threshold between problems and concepts. Simultaneously, this analysis exposes and normatively questions the judgments, that is the valuations, that drive a science to pursue problems within the regime of concepts: if it is true that 'the problem itself persists' at the heart of its scientific solutions, the task of historical epistemology can only reside in the constant liquefaction of facts with a view to the values that remain sedimented inside them. This dynamic operation, in turn, is rendered possible by the immanent split of the process of problematisation, the split that separates the πρόβλημα from its πρότασις. Only four years after the *Traité*, co-written with Camille Planet, Canguilhem will move to an integration of his reflexive analysis into a philosophical vocabulary of life and of biological normativity. But the oblique model of and complement to this vitalism, it seems to me, needs to be identified in his epistemology of 'reflexive analysis'. It is only along the lines of such an analysis that the genuinely vital dialectics of the sciences, their interplay between 'moments of crisis' and 'moments of stability', can garner their full credit.[2]

2 'Du moment que nous parlons de science, c'est-à-dire de connaissance vraie, nous sommes dans l'ordre de cette opération mentale qui seule peut être dite vraie ou fausse, c'est-à-dire l'établissement dans le jugement d'un rapport entre concepts. […] Le fait n'est pas ce dont la science est faite, mais ce que fait la science en se faisant. […] Donc s'il est vrai qu'il n'y a de science que sous forme de théorie, c'est-à-dire de démonstration, et qu'il n'y a pas de démonstration sans principes, nous dirons que la science expérimentale est celle qui va à la recherche de ses principes. Le concept de science expérimentale est un concept mixte qui retient à la fois la relation de la science à l'expérience comme au problème à résoudre et la relation de l'expérience à la science comme au théoreme, c'est-à-dire au problème résolu. […] Mais si toute science est théorie, composition rationnelle, c'est-à-dire déductive de

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concepts, il y a dans la constitution des théories des moments de stabilité et des moments de crise. Il y a une naissance, une vie et une mort des théories.' (Canguilhem 2015: 370-371)

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