Zeitschrift: Entretiens sur l'Antiquité classique
Herausgeber: Fondation Hardt pour l'étude de l'Antiquité classique
Band: 49 (2003)

Artikel: Causation in Galen
Autor: Hankinson, R.J.
DOI: https://doi.org/10.5169/seals-660653

II

R.J. HANKINSON

CAUSATION IN GALEN

Much of the disagreement between the later Greek schools of medicine, the Dogmatists, the Empiricists, and the Methodists, turned on the issue of the nature and discoverability of causal connections. Dogmatists, whatever else their differences, tended to agree that a causal understanding of the inner workings of the body, and of the progress of disease, was necessary for the latter's treatment.[1] They also were wont to essay precise distinctions in causal categorization, differentiating at the very least between the internal conditions responsible for (or predisposing towards) illness, and the external, antecedent occasions of those illnesses, their *aitia prokatarktika.* Empiricists refused to allow that the internal conditions were discoverable, or that even if they were an understanding of them would be of any use to therapy; but they took careful note of the antecedent circumstances that seemed relevant to particular conditions, in order to be able better to predict likely outcomes in future cases. The Methodists took no notice of such alleged *aitia prokatarktika*, supposing rather that all diseases were simply matters of excessive constriction or dilatation (or a combination of the two), and that the existence of such conditions was phenomenally obvious, at least to the trained eye, and dictated an allopathic therapeutic intervention.

[1] Partial, and controversial, exceptions to this rule are Herophilus (on whom see HANKINSON 1990 and 1998, 2670-81) and Erasistratus (of whom more below; cf. HANKINSON 1998, *passim*).

Galen is, on this score at least, a Dogmatist; and his rationalist rejection of Empiricist methodology as inadequate and Methodism as totally mistaken, a rejection to be found throughout his works, but most conveniently dealt with in *De sectis ingredientibus* (*SI*), presupposes a particular analysis of physiology, pathology, and their interrelations, as well as of the proper method of medical semiotics. At *De methodo medendi* (*MM*) 4.3, X 242-249 K, he takes issue with the Empiricist view that one may infer directly from the *aitia prokatarktika* of diseases to their proper treatment:

> None of the procatarctic causes of a disposition (*diathesis*) is indicative of therapy, but the indication (*endeixis*) of it [sc. therapy] begins from the disposition itself, while the individual activities (*energeiai*) are discovered both from the primary goal (*skopos*) and from the nature of the affected part, and of its ambient temperament (*krasis*), and what ever else are related to these things.[2] (1: *MM* X 242.16-243.3 K)

Thus for Galen it is crucial to be able to determine the state of the internal dispositions of the body, which themselves determine the functioning of its proper activities or *energeiai*. It is not enough simply to catalogue the external occasions of disfunction.

Earlier, at *MM* 1.8, X 63-67 K, in the course of a lengthy attack on the inadequacies of Erasistratean and Methodist pathology, Galen has offered his own account of the structure of proper (and deviant) bodily functioning. There are four elements: (1) the bodies themselves, or rather their dispositions; (2) their activities, what they characteristically do; (3) the causes of the bodily dispositions; and finally (4) "those which obtain in bodies both naturally and unnaturally, but which neither promote nor impede the activities" (64.11-13), the "symptoms

[2] All the technical terms of this passage are important and will be discussed further below.

which are necessarily consequent on the different alterations in bodies, whether they are in a natural state or not" (65.1-3).

A little later, at *MM* 2.4-5, X 97-115 K, Galen attacks both Methodists and Erasistrateans for their failure to attend to the proper causal structure of things. Galen's opponents are presented as treating what are simply concomitants or symptoms of the disease as though it were the disease itself (this is a charge distinct from, albeit obviously related to, that of the earlier passage in which he castigated their terminological confusions: *MM* 1.7-8, X 53-67 K). Galen posits someone who says

> That the reason why someone who has been fed exclusively on milk for several days is now unable to digest properly is the colour of his stomach has been altered, turned white instead of red: I think you would laugh, and rightly so. (2: *MM* 2.4, X 97.15-18 K)

This is a fictitious case, but no different, Galen says, from the practice of his opponents of holding various physiological conditions which they suppose to be concomitant with damage to natural activities responsible for the damage (97-98). But it is vital to distinguish the causal order of things. If the fictitious opponent persists in holding variations in gastric colour responsible for variations in digestive functioning, then

> I know of no way [sc. of refuting him] other than by demanding of the person making these claims to show first how it is that the stomach generally operates naturally as a result of its colour. (3: *MM* 2.4, X 98.10-13 K)

Galen's point is clear: even if it is true that variations of gastric function are attended by variations in colour, that is not enough to show that the latter are the cause of the former (although it may be good evidence for the supposition that they are causally connected in some way): causation is a matter of operational, and not merely functional, dependence.

Consider again elements (1)-(4) above. They are linked, Galen says in the following way:

> There are four different types of things that occur in bodies contrary to nature... one is the impaired activity itself [answering to (2)], the second is the disposition that brings it about [(1)], the third its causes [(3)], and the fourth the symptoms that necessarily follow it [(4)]. (4: *MM* 2.1, X 78.1-6 K)

Thus the underlying disposition (1), which is impaired or unnatural in the case of illness, brings about the damage to the activity itself (2), while in turn (1) itself has causes which are responsible for it (3); and finally the impaired activity (or perhaps the disposition responsible for it) bring further consequences (4), such as the gastric coloration of the man on the milk-diet, in their train. As regards (3), Galen writes:

> Something must stand in the same relation to the dispositions as the dispositions do to the activities, differing in one respect only, that the dispositions exist at the same time as the activities and it is never possible for an activity to be properly constituted unless the disposition of the bodies is natural, nor for it to be impaired without previous damage to the bodies [they are thus synectic causes of it: see further below]. The causes of the dispositions which impede the activities, however, may either have ceased to exist or still be in existence. (5: *MM* 1.8, X 63.18-64.8 K)

Why must something stand in the same relation to (1) as (1) does to (2)? The short answer is that Galen takes it to be axiomatic, and apprehensible *a priori*, that "nothing occurs without a cause" (*MM* 1.7, X 50.2-3 K; cf. 1.4, X 36-7; *De propriis placitis* [*Sent.Prop.*] 14.1, p.110 Nutton: n.32 below).[3] Hence the physical dispositions, whatever they are, which impair the natural activities must themselves in turn have been caused by

[3] On this and other causal axioms for Galen, and on their metaphysical and epistemological status, see HANKINSON 1998a, 376; 1991c; and 1991a, *ad loc.*

something. But by what? And what in any case are these dispositions? Answering those questions will takes us further into the terminological heart of Galen's theorizing.

In any event, Galen insists, typically, that, as long as one understands the basic schema of (1)-(4), and equally when one knows what as a matter of fact in each case fit into each of the schematic categories, it doesn't much matter which of (1) or (2) you choose to call the disease, as long as you do so consistently.[4] Reasonable fidelity to ordinary usage will rule out, he thinks, the candidacy of either (3) or (4), as well as the aggregate of all of them;[5] so, since

> It is essential that we assign names... clearly...; let us then call the disposition [(1)] that impedes the activity [(2)] the disease; whatever follows from it [(4)] a symptom; and whatever is responsible for it [(3)] a cause. (**6**: *MM* 2.1, X 81.12-16 K; cf. 1.8, X 65; and *CC* 8.10-12)

"Whatever follows from it" suggests that 'symptom' can be used more broadly than merely to cover the adventitious consequences of damage to activities (or the dispositions which cause them); and this is not a casual mistake. Earlier, Galen has suggested (although not necessarily in his own voice) calling the damage to the activity a "special symptom" of the disease (*MM* 1.8, X 65.9-10 K). Moreover, he will also on occasion treat symptoms as being dispositions (as indeed they are), although not of course dispositions in the sense of (1), those causally responsible for damage to activities. However that may be, the

[4] Cf. *De causis contentivis* 8.10-12, 10.7-8.

[5] See *MM* 2.1, X 78-79 K: if the aggregate of (1)-(4) is the disease, then the expressions "cause of disease" and "symptom of disease" become meaningless (since they imply distinctness from the disease, and yet on this conception of disease it comprehends them); and yet (Galen implies) they are not (his argument here is not wholly convincing: see HANKINSON 1991a, 161-2); and of course similar considerations will exclude (3) and (4) individually (and indeed collectively, although Galen doesn't canvas this possibility) as possible candidates for the referent of the term 'disease'.

broad outlines of the official position are summed up in a passage from *De symptomatum differentiis* (*Symp.Diff.*):

> A disease is a disposition of the body which is such as primarily[6] to impede one of its activities; those dispositions which precede (προηγοῦνται) it are not indeed diseases. And if some other dispositions happen along with them, following along with them like shadows,[7] we shall not call them diseases either, but symptoms, and so, on our account, not just anything which occurs in a body contrary to nature should immediately be labelled a disease, but rather only that which primarily harms an activity <should be called> a disease, while what precedes (προηγούμενον) it <should be called> a cause of the disease, but not indeed a disease. And if some other bodily disposition follows upon the disease, this will be called a symptom. Furthermore, the actual harm to the activity is a symptom of the animal, since everything unnatural in any way which occurs in the animal is a symptom: for this is how ordinary Greek usage regarding names has it. (7: *Symp.Diff.* 1, VII 50.4-17 K)

The taxonomy of unnatural conditions which we have been briefly analyzing presupposes, or at least is conditioned by, a particular theory of causation. In the domain (roughly) of what was for Aristotle and his followers efficient causation, the Stoics[8] distinguished between *aitia prokatarktika* and what they called *aitia sunektika* (or *sunechê*, or *sunechonta*: here as elsewhere the causal vocabulary is rich to the point of indigestibility with synonyms): containing causes.[9] This distinction was taken over

[6] The sense of 'primarily' (*prôtôs*) here is important: see below p. 50.

[7] Compare the famous Pyrrhonian image of ἀταραξία following on ἐποχή "as a shadow does a body": SEXT.EMP. *PH* 1.29; cf. DIOG.LAERT. 9.107, who attributes the image to Timon and Aenesidemus.

[8] See FREDE 1980; BOBZIEN 1998b, esp. ch. 6; HANKINSON 1999.

[9] The translations for these terms into English are equally varied. *Aition sunektikon* has been variously rendered as 'containing cause' (perhaps the most common, and my reluctant preference), 'cohesive cause' and 'sustaining cause', none of which gets it quite right; I had toyed with the translation 'comprehensive',

by the doctors, including Galen, although not without some refinements.

In what follows, I shall not say much about *aitia prokatarktika*, although the subject is important and I have dealt with it extensively elsewhere.[10] Suffice it to say that *aitia prokatarktika* are the evident, external occasions which set in train a pathogenic sequence of events. For such a set of events to unfold, conditions in the body of the patient must be propitious (or the reverse); which explains why not everybody is susceptible to the same antecedent causes (only if I am of an excessively hot and dry temperament, for example, will I develop heat-stroke after only mild exposure to sunlight: *CP* II 11-16), which in turn serves to defuse the objections of Erasistratus and others that they cannot be causes because they do not affect all equally. Thus, in fact, procatarctic causes serve to reveal those internal weaknesses — and as such are, for Galen, indicators of the internal conditions of individuals' bodies, internal conditions the knowledge of which is vital for successful therapy (*MM* 4.3, X 242-249 K).

By contrast, *aitia sunektika* are altogether more tightly linked to their purported outcomes. In its original Stoic sense, as Galen

which is a bit closer both to the literal meaning and to some of the implications of the term, but it too has unfortunate and misleading connotations; I shall adopt the convention (generally) of simply transliterating as 'synectic causes'. *Aition prokatarktikon* has fared no better, yielding 'antecedent cause', 'initial cause', 'salient cause' (via the Arabic); I was also tempted to seek a new rendering here too, but all the alternatives that suggested themselves ('pre-initiating', 'pre-arising', 'pre-originating') seemed too rebarbative; and so I will also adhere to the parallel convention of calling them 'procatarctic causes'.

[10] See HANKINSON 1987, 1988a, 1994a. Galen wrote a short text *De causis procatarcticis* [*CP*] vindicating their importance against the attacks of Erasistratus and others; it is edited with translation and commentary in HANKINSON 1998b. Erasistratus argued that antecedent causes, since they are not invariably followed by their purported effects, cannot properly be causes of them; thus he is committed — absurdly in Galen's view — to the position that all genuine causes must be sufficient for their effects. Galen agrees that *aitia prokatarktika* are not sufficient for their effects but denies that this means that they cannot have causal relevance to such outcomes as one of a number of contributory factors; equally, there is no reason to deny them the title of causes.

himself makes clear in his opusculum on the subject, *De causis contentivis* (*CC*),[11] a synectic cause was the cause of the existence of something;[12] they were identified with the subtle, volatile *pneuma* which, according to their physics, pervades everything (*CC* 1.1-5). Galen himself rejects this account, holding that in change it is the elements themselves which are directly affected and not some postulated *pneuma* which holds them together (3.1-5.5); but more importantly for our purposes he also rejects the view that it is an *a priori* causal axiom ("one indemonstrable and self-justifying") that "no body can exist in any state whatever without a synectic cause", holding that it leads to regress (since the Stoics themselves insist that causes are bodies: *CC* 6.1-3). In Galen's view, no cause of existence (or persistence) on the Stoic (or Neoplatonist, or Cartesian for that matter) model is required, and every genuine cause, on examination, will turn out to be one of generation and not one of being (*CC* 7.1-2; cf. *Adversus Julianum* XVIIIA 280 K; *De plenitudine* VII 524-528 K): "what has already been produced must necessarily have been so as a result of some cause, but is no longer in any need of a cause" (*CC* 7.3) — one might label this Galen's Principle of Causal Inertia, or PCI.[13]

[11] *CC* survives only in Latin and Arabic; the Latin text is edited in Kalbfleisch (1904); the Arabic in Lyons (1969).

[12] Hence Sedley's translation "sustaining causes": above, n.9.

[13] Jonathan Barnes asked whether this formulation was too strong — surely Galen allows that some types of persistent thing require causes of their persistence, his so-called *aitia phulaktika* (cf. e.g. *Ars Med.* I 365-366 K), and in that case should not PCI be weakened to the claim that some cases of persistent existence require no cause? I think it is better, however, to insist that for Galen existence properly so-called requires no preservative cause, although there are certain sorts of state, which involve the maintenance of a constant dynamic tension, which do require constantly active causes for their preservation — but such states are, precisely, better thought of as activities. Galen gives an example (*CC* 8.7-8): statues that are designed to lean forwards and would otherwise overbalance may be balanced in the rear with lead to prevent their toppling over. They seem to be at rest (i.e. in a state of continuous unchanging existence), but in fact their equilibrium is preserved by the constant dynamic tension of the opposing forces. In a similar vein, at *De motu musculorum* (*Mot.Musc.*) 1.8, IV 402-403 K, Galen argues that one should describe a hovering bird not as being at rest, but as rising

Galen diagnoses the source of this error (namely the rejection of PCI) in the mistaken belief that certain things which do have synectic causes (walking and talking) may be thought of as types of actual existence rather than of generation (certainly they are for Aristotle and others prime examples of *energeiai*): but in fact, properly understood, they are fundamentally processes, and as such can indeed have synectic causes (*CC* 8.1-2). The same is true of the pulse — in a sense it exists throughout one's life, but it is in fact a constant state of change (8.3-5). Even so, one may talk of synectic causes of the pulse metaphorically, as Galen himself has done:[14] the three synectic causes of the pulse being its function,[15] the vital capacity (*dunamis*) and the physical structure (heart and arteries) which produce it (8.6); we shall return to this claim shortly.

The main features of the Stoic synectic cause which are retained in the 'metaphorical' medical usage[16] are its co-temporality with its effect, and the functional dependence of the effect on the strength of the cause. Sextus (*PH* 3.15) gives as an example the dependence of the strangulation on the tightness of the noose (there is strangulation just as long as the noose is drawn

by its own muscular power at precisely the same rate at which it is falling due to its weight. Both of these cases, involving as they do an equipoise of constant dynamic tension, require continuously acting causes for their maintenance.

[14] The reference is to *De causis pulsuum* (*Caus.Puls.*), esp. 1.1-4, IX 1-7 K; see further text **10** below.

[15] *Chreia*: another word hopelessly difficult of translation, and variously rendered 'use', 'need', 'purpose', 'usefulness', 'utility', etc. At *De praesagitione ex pulsibus* (*Praes.Puls.*) 1.1, IX 210 K, Galen says that the *chreia* of the pulse is twofold: to preserve the innate heat, and to generate psychic *pneuma* (the instrument with which the soul effects purposive action); *Caus.Puls.* 1.3, IX 5-6 K concurs, adding the further function of expelling any smoky residue produced by combustion of the humours.

[16] And it should be pointed out that the Stoics themselves were perfectly happy to posit synectic causes of processes as well as of existence; in a famous example, Chrysippus compares human action with a rolling cylinder: it requires an external shove (analagous to the external impression need to move humans to action) to start it moving, but thereafter it moves under its own steam, as result of "its own force and nature" (CIC. *Fat.* 43), because of its "rollability"; on this, see HANKINSON 1999.

tight, and the tighter the noose the more severe the strangulation).[17] Synectic causes, then, are as one might say strongly, that is functionally, sufficient for their effects.[18]

Galen broadly accepts this account. In the course of discussing the reasons why the pupil dilates and contracts, he writes:

> The synectic cause, as one might say, of the generation of this [sc. dilation] is the tension of choroid membrane, just as its relaxation <is the synectic cause> of its contraction. (**8**: *Caus.Symp.* 1.2, VII 93 K)[19]

Just as in the case of the noose, there is a direct, indeed mechanical, connection between the tension of the membrane and the condition of the pupil. But of course this fact in itself is perfectly consistent with other causal factors being involved in particular cases of dilation or contraction (just as they may be in the case of the strangulation); we can ask about why it's a good (or in pathological cases a bad) thing for the pupil to be in the condition it's in; and we may refer to the action of the incidence of external light on the eye in bringing about alterations in the tension of the choroid membrane. That is to say, causal explanation will typically, and necessarily if it is to be complete, pay attention to a variety of different factors, all of which have an important role to play in the outcome. It is critical, in Galen's view, to be aware in general of the multiplicity of causal categories, and in particular cases correctly to assign to them the operative factors.

So far, then, the following picture has begun to emerge. Following the initial distinctions made by the Stoics, Galen distinguishes between *aitia sunektika*, present causes of present

[17] Cf. Ps.-Galen *Definitiones medicae* (*Def.Med.*) XIX 393 K: "Synectic causes are those which are such that when present the effect is present, when absent the effect is absent, when increased the effect is increased".

[18] Whether or not they are necessary for them depends on how the effects are to be individuated — and herein indeed lies one of Galen's substantial objections to the procedures of various other doctors; cf. text **14** below.

[19] And at *Caus.Symp.* 1.7, VII 132 K, he claims that heat is a synectic cause of not feeling hungry (just as cold is one of hunger).

effects whose intensity is directly correlated with that of the effects, and causal factors which precede their effects. And in so doing, he is of course answering to an absolutely general feature of ordinary causal assumptions, namely that we suppose sometimes that causes are co-temporal with their effects, but at the same time we want causation to be a temporally directional process involving the propagation of influence from earlier to later events; and this typically will involve causes which antedate their effects, and which may well no longer exist at later times when their effects are still felt. And these answer roughly to the Stoics' *aitia prokatarktika*.

But, at any rate in medical contexts, the situation is complicated by the appearance of a third category, *aitia proêgoumena* or preceding causes. These are by no means ubiquitous; and on occasion when Galen uses the verb *proêgeisthai* in causal contexts he does so non-technically, as an umbrella-term to cover any and every cause which precedes its effects (and hence to include procatarctic causes), as is apparently the case in text 7 above (indeed, if 'precede' is intended in an operational as opposed to a temporal sense, then it will cover synectic causes as well).[20] But on occasion he will also use the term *aition proêgoumenon* to refer to a stage of the causal process intermediate between procatarctic and synectic causes. On the other hand, he never deploys the distinction between causes *kath'hauta* and *kata sumbebêkos* as Aristotle does (*Ph.* 2.3, 195 a 26-b 4)[21] to distinguish between explanatorily lucid ways of picking out the appropriate

[20] And cf. *Praes.Puls.* 1.8, IX 267-268 K; *Caus.Puls.* 4.1, IX 156-157 K; *MM* 2.2, X 84-85; 11.13, 774 K; *De naturalibus facultatibus* (*Nat.Fac.*) 1.4, II 10.3-5 K; *De differentiis febrium* (*Diff.Feb.*) 1.8-9, VII 302-305 K; in some (but not all) these cases the non-technical nature of the terminology is signalled by the use of the aorist participle, προηγησαμένος, as for example in the phrase φανερᾶς προηγησαμένης αἰτίας (*Diff.Feb.* 1.8, VII 302.15 K), where the φανερά clearly indicates that the cause is external (in the appropriate sense: see HANKINSON 1987) and hence procatarctic.

[21] Although he does recommend replacing the name of a condition with its definition precisely in order to make its causal properties lucid: *MM* 1.5, X 39-40 K; see HANKINSON 1991a, *ad loc.*

causal factor and those which are not, which is of a piece with his later Greek emphasis on causation as a productive relation holding between types of events and dispositions, rather than on explanation as an intensional, referentially-opaque phenomenon. This terminology is also often ascribed to the Stoics, and I am less certain than I once was that this ascription is mistaken.[22] But it was certainly developed by doctors, in particular Athenaeus of Attaleia, founder of the Pneumatist school of medicine:

> (I) The distinctions [sc. in causal type], which Athenaeus held to be three, are these: first there are synectic causes, second preceding causes, and third procatarctic causes. They call the latter everything which exists outside the body and harms it, bringing on illness, while those which are of the kind that work within the body are called preceding causes, while the alterations of the innate *pneuma* which are brought about by them and even by externals such as the moistening, drying, cooling and heating of the body he calls synectic causes of diseases, since this *pneuma* permeates throughout the uniform parts, and alters them as it alters itself. (II) But frequently they say that synectic causes are produced directly by procatarctic causes. For example, when one is thoroughly heated by the sun, they say that our innate *pneuma* is of necessity made warmer in itself... (III) When these changes are small, then the disease is not yet established in the body; but when any part has its natural temperament altered to such an extent that its activities are harmed, a disease is produced in accordance with the distemper, which has as its synectic cause the immoderately warmed *pneuma*... (IV) The adherents of this school call the humours generated in the body when these are too hot or cold or moist or dry preceding causes; for they say that in time the solid parts are affected by them, which immediately leads to their activities being harmed. (9: *CC* 2.2-5)

[22] Compare HANKINSON 1987, with HANKINSON 1996, 1999.

Galen does not endorse the details of the pneumatic pathology here; but he does accept in its broad outlines the causal taxonomy it embodies, of internal changes to the constitution of the body being set in train by some external event and leading ultimately (if nothing is done about it) to an alteration of its internal physical structure which is sufficient to cause damage to some of its vital activities. Now, as we have seen, for Galen at least, the latter is not the disease itself but a consequence of it, the disease being the last stage in the causal chain, the distortion of the underlying dispositions which produce it; the disease, then, is itself for Galen a synectic cause (of functional damage); but this does not exclude the possibility of its also having synectic causes; and in any event, there may very well be stages in the process set in train by the procatarctic cause and culminating ultimately in the disease which damages the activity which are to be identified with neither of them, stages which may or may not be in some sense sufficient for their successors.

Here is Galen's most detailed account of the matter:

> (I) Of causes which bring about changes in pulses, some are causes of the generation of them while others are causes only of their alteration. Causes of their generation are the function (*chreia*) for the sake of which they are generated and the capacity (*dunamis*) by which and the instruments (*organa*) by means of which they are propagated, while all the rest are causes of their alteration, both those which are called preceding (*proêgoumena*) and those which are antecedent (*prokatarktika*) even to them. (II) So the genus of causes, not only in regard to pulses but in regard to everything else as well, is threefold: one, the primary and most important, which they call 'synectic', derives the name from its encompassing the essence of them [sc. the things it causes], and is a cause of generation, as we said earlier. (III) The other two classes are not responsible for the generation of pulses, but are rather causes which bring about changes

in pulses which have already been generated: thus thickness or abundance or viscosity or acridness of humours cannot produce pulses, but they can alter them. (IV) And equally cold and warm baths, winter and summer, and cold and heat in general, are causes of the alteration of pulses but not of their generation. And these latter are called 'procatarctic', being prior even to those in respect of the humours, which are preceding <causes>. (V) Speaking generally, things which are external to a body and alter it in some way are called procatarctic causes, because they precede the dispositions (*diatheseis*) of the body. Whenever these dispositions condition synectic causes, they are preceding causes of them. (VI) For instance, external cold brings about constriction of the skin, and as a result of that constriction normal exhalations are checked, which, being checked, form a mass, causing a fever to take hold, which alters the function of the pulse, which in turn changes the pulse itself. (VII) In this case the procatarctic cause is the external cold, while all the rest up to the alteration of the function of the pulse are preceding causes; and through the mediation of the preceding causes, the procatarctic cause alters the function of the pulse, which is one of the synectic causes, and this in turn brings about a change in the pulses themselves, (VIII) since it is not possible to bring about a change in some synectic cause and for what is brought to completion by it to remain unchanged. But unless an alteration is effected in one of the synectic causes, it is impossible to bring about a change in the pulses. (IX) For this reason these are the most important and most particular and primary causes of the pulses, and all the others are <causes> because of them. For it is on account of their effecting an externally generated alteration to the synectic causes that they are called causes, since in respect of their own particular substance and nature they are in no way capable of bringing about a change in them. (**10:** *Caus.Puls.* 1.1, IX 1-3.15 K)

That lengthy passage contains much of interest, and not a little to puzzle over. It is important to bear in mind that, although it embodies much of general import, it is still directed specifically towards the causal explanation of the pulses. Thus it should not be supposed on the strength of (I)-(IV) that no procatarctic or preceding cause can ever properly be described as a cause of something's generation, but only of its alteration, since in plenty of cases (in particular those having to do with the aetiology of disease), procatarctic causes, being in general necessary conditions of their outcomes, will indeed be causally implicated in the generation of things and not merely in changing them when they already exist. Equally, the sense of 'generation' at issue here is not that of 'create from scratch': the pulse, after all, as Galen himself emphasizes (*Caus.Puls.* 1,1, IX 4 K), is going to be there as long as the animal is alive, but it will require (in his view) a constantly active synectic cause (or set of synectic causes) to keep it going. But what is being generated, then, is the constant stream of activity; this is not a case to be rejected on the grounds of PCI.[23]

(II)-(IV) indicate that Galen is working with much the same general distinction between preceding and procatarctic causes as that which he attributes to Athenaeus of Attaleia; and this is confirmed by the example and analysis of (VI)-(VII). A Chill falling on the body from the outside is the procatarctic cause which brings about a sequence of events in the body, culminating in the alteration of the function of the pulse, which is the synectic cause (of the alteration in the pulse itself), all the intermediaries being preceding causes of it. It was, as we saw, a definitional feature of synectic causes that they are in a certain sense strongly sufficient for their effects, and are contemporaneous with them (although in quite what sense they are sufficient will require further specification). Thus as soon as the function of the pulse is changed, the pulse will alter in response (VIII). On the

[23] See n.13 above.

other hand, procatarctic causes are not sufficient for their effects (it is this which leads Erasistratus to deny that they are causes at all: *CP* I 6-10, VIII 96-114, XIII-XIV 162-186; Hankinson 1998b, 30-36; n.12 above). The case is less clear with the preceding causes; but the example of (VI) strongly suggests that preceding causes form a chain that will, in the normal run of things (i.e. if no extraordinary steps are taken to disrupt it), produce the synectic cause, and hence the disease; and this is consistent with the indications one finds elsewhere. Thus they will not be sufficient *tout court* for the synectic cause, but will be so other things being equal. And that is all to the good: the language of sufficiency (standardly indicating as it does a logical relation) is not ideally suited to capture the complexities of trans-temporal causation. On the other hand, it seems harmless enough in the case of the synectic cause: it is functionally co-variant with its effects, but, since it *is* their cause, the only way of altering the effects is by affecting the cause, which is precisely what (VIII) claims (note the directionality of the claim: it is not only that synectic causes and their effects are co-variant — it is that the relation of dependence runs from cause to effect and not *vice versa*).

However, things are not that simple. First of all, we need to ask what, precisely, is it to "alter the function of the pulse". And we need briefly to examine the notion of a function (*chreia*) here, and also to examine its relations with the other things described in this case as synectic causes, "the capacity by which and the instruments by means of which they are propagated" (**10** (I)).

That natural things have *chreiai* is a basic item of Galenic faith, and is at the core of his teleological view of the structure of the universe and its occupants.[24] His teleology is, as one might have expected, an amalgam of that of Plato and Aristotle. From Aristotle (and in particular *De partibus animalium*) he takes over the idea that animals are hierarchically organized

[24] For detailed accounts of Galen's teleology, see HANKINSON 1988b, 1989.

functional units, within which each part and its activities plays a subservient role directed towards the overall well-functioning of the whole. His monumental *De usu partium* (*UP*)[25] seeks to develop such a functional, teleological account in respect of the *chreiai* of all animal parts; and he does so explicitly by way of reference, in strikingly Platonic fashion, to the excellence of the design of the Demiurge. He takes issue particularly with Erasistratus and Asclepiades for not appreciating the fundamentally teleological nature of nature, and for having the temerity to suppose that some organs are without function (cf. *Nat.Fac.* 1.13, II 34-36 K; 2.4, II 91-92 K); and he refuses even to allow, with Aristotle, that some organs may be only indirectly teleologically explicable, as the necessary but in themselves purposeless consequences of other teleologically valuable processes.

So Galen stakes out a fairly extreme position in the pivotal ancient debate between teleology and mechanism: nature is a kingdom of ends, and you cannot understand it unless you understand its purposes. But that still leaves us with our initial question: what exactly are these *chreiai*? Galen distinguishes (*UP* 17.1, II p.437-8 Helmreich [= IV 346-348 K]) between the functions of the parts, and those of their *energeiai*, where the former subserve the latter: thus the function of the heart is to pump the blood, but that pumping itself is undertaken for some reason (to convey nutriment in the form of *pneuma* to the extremities, in Galen's view, and to regulate the body's internal heat: *Caus.Puls.* 1.3, IX 5.17-6.5 K; *De usu pulsuum* [*Us.Puls.*] 3, V 160-161; 8, 179 K).[26] Galen goes on to write "the *energeia* of a part differs from its *chreia* ... in that an *energeia* is an active

[25] Edited by G. HELMREICH (Leipzig 1907-1909).

[26] *Us.Puls.* is edited on D.J. FURLEY and J.S. WILKIE (Princeton 1984); it is devoted to showing that the *chreia* of the pulse and that of breathing are the same (regulation of innate heat and the expulsion of the "smoky residue": 3, V 161.11-12 K; cf. *De utilitate respirationis* [*Ut.Resp.*] 3, IV 491-492 K), in spite of differences in their modality of operation, and in spite of the fact that the stopping of breathing is immediately fatal, whereas the stopping of the pulse (at any rate in certain parts of the body) is not (*Us.Puls.* 1, V 149-153 K).

motion, whereas the *chreia* is what is commonly called utility (*euchrêstia*)". Moreover, an *energeia* is an internally-directed activity, something genuinely attributable to the part or structure itself, and simply some passive alteration induced by some external influence. Thus a *chreia* is what some activity, the normal functioning of the part in question, is for, what, in the overall economy of the animal, it seeks to accomplish;[27] and hence it serves to explain, teleologically, the existence of the activity in question.

Quite how such purposes come to be expressed is another matter. In *On the formation of the foetus* (*Foet.Form.*) Galen expresses puzzlement at how a structure as complex as the human embryo can arise from purely mechanical sources (clearly it can't just be chance, and it evidently involves design: 6, IV 687-689; 6, IV 693-6 K); the semen "contains the design of the craftsman" (5, IV 682 K), but it is not reasonable to suppose that first creative force simply disappears as soon as it has set things in motion: more probably it continues to work in some way until the parts are complete, when they are able to perform their own functions (5, IV 683-684 K). Finally (IV 700-702 K) Galen confesses himself at an *impasse* regarding the substance of the soul and how it operates, and as to how it comes to be formed in the first place — it seems unreasonable to suppose that the mere vegetative power of the seed can do the trick, and yet he finds the opinion of a Platonist that the artificing soul of the Demiurge extends throughout universe implausible: he cannot accept that scorpions and other noxious creatures could have been constructed by such a soul. So Galen is cautious about committing himself to the actual mechanisms

[27] As J.S. WILKIE ("'Use' and 'Activity'": Introduction, Section IV of D.J. FURLEY and J.S.WILKIE, 1984) notes, one may know the *chreia* of something without knowing its *energeia* (one may know what something is for without knowing how it does it) and *vice versa*: he instances the case of the circulation of the blood in the period immediately after William Harvey — it was known, on the basis of Harvey's elegant experiments and inferences, that the blood circulated, but not why it did so.

involved in particular types of generation; but that there are such mechanisms he thinks certain. Galen's Demiurge will require physical structures and their activities to carry out his designs, both on the large scale in the animal as a whole, and in the various sub-routines which go towards maintaining it.

Consider once again the beginning of *Caus.Puls.* Both the *chreia* and the capacity of the heart and the physical structures associated with it are synectic causes of the pulse, and not just of the pulse *tout court* but of its variations. For the *chreia* itself can vary, or perhaps rather require a varied response, according to circumstances. One of the functions of the pulse is to assist in regulating the body's natural heat (*Us.Puls.* 3, V 161 K), and obviously if the body is overheated, then it is going to need to work harder. This is the sense in which the pulse is responsive to the need, or *chreia*, and hence that in which the *chreia* is its synectic cause.

But matters are not quite as simple as that. As we have seen, Galen says that the *chreia* is only one of the synectic causes, along with the *dunamis* contributed by the heart and the physical structures of the heart and arteries themselves. The notion of there being more than one synectic cause of the same effect is at first sight surprising: synectic causes, after all, are supposed to be strongly sufficient for and co-temporal with their effects; so how could there be more than one of them? In one sense that question is easily enough answered: (a) the tension on the noose is the synectic cause of (b) the strangling, but (c) the pressure on the hands is the cause of (a), and perhaps (d) the intensity of the volition of the strangler is the cause of (c); here there is a sequence of distinct items, but distinct not in time but in analysis as events.[28]

[28] Note also that the items in this example meet another condition on genuine causality, namely that causes should be logically distinct from the things of which they are causes — and Galen is admirably sensitive to that Humean constraint. At *CC* 9.6-7, Galen rejects the view of those "who say that heating of the head by the sun is the synectic cause of the warmth that results in it, and that the cut is the synectic cause of the wound" on the grounds that the alleged causes here amount to no more than re-descriptions of the effects.

But in this case, it is perhaps better to speak of a sequence of synectic causes of one another, rather than of concurrent synectic causes of the same outcome: in other words, rather than treating (a), (c) and (d) all as synectic causes of (b), (d) causes (c) which causes (a) which causes (b). That distinction may appear somewhat scholastic: but there is a point to it, and it would probably have been endorsed by Galen. At all events, at *Symp.Diff.* 1, VII 47-48 K, Galen considers such a causal sequence (actually probably rather a temporal one — but that does not matter here) in which the first causes the second, the second the third, and so on; and he stipulates that while the first causes the second, and the second the third "primarily and essentially", the first causes the third "secondarily and incidentally (*kata sumbebêkos*)", although the second causes the third primarily and essentially (and cf. **11** below).[29] In other words, causal proximity is important: to be a remote cause is, for Galen, one of the ways of being an incidental cause (see below, p. 58). This in turn suggests that for something to be a synectic cause it must be proximate in this sense; and indeed at *Caus.Symp.* 5, VII 109 K, Galen says that it makes no difference whether you call the cause synectic, containing (*sunechon*) or proximate (*proseches*), which suggests that for him at least proximate (or direct) causes just are synectic causes (see also *MM* 2.4, X 97 K: certain doctors refer to the primary cause of an activity its proximate cause; and cf. 99; 2.6, X 116 K).[30]

[29] Galen actually suggests a further elaboration — the first causes the fourth "thirdly", etc. — but this need not detain us.

[30] This identification is by no means universal, however: if *aition proseches* lies behind Cicero's *causa proxima* at *Fat.* 41 (as seems very probable), then for Chrysippus a proximate cause is distinct from a synectic cause — indeed it is to be assimilated to an antecedent, procatarctic cause (however the case is complicated: at *ibid.* 44, Cicero seems to identify proximate and synectic causes). See HANKINSON 1996. The practice of Erasistratus seems different again; apparently for him nothing is properly a cause unless it is proximate, in the sense of being immediately precedent to, its effect: *CP* XIV 174-176; see HANKINSON 1998b, *ad loc.*

In fact, it seems that when Galen refers to the three factors being synectic causes of the condition of the pulse, he means that they are so taken together. The *chreia* on its own is not enough to condition the pulse — it requires the *dunamis* of the heart and the organic parts to be properly constituted too in order to be able to do its work; indeed, the *chreia* only gets properly expressed if these conditions are in place. This in turn indicates another important feature of Galen's conception of the synectic cause — such causes are sufficient for their effects only *ceteris paribus*: something may interfere with their having their customary effects. Thus we can say of the *chreia* that it is other things being equal sufficient for the alteration of the pulse; if everything else is as it should be, then an alteration in it will produce a functionally corresponding alteration in its effect, and will do so immediately. It is in this sense, then, that such causes can be considered to be synectic — but not of course that each of them is capable of inducing its effect in total isolation from everything else. Thus Galen seeks to sophisticate and deepen the methods and categories of causal analysis which he has inherited from the tradition. Indeed, in an important and little-discussed passage, Galen recognizes that in order to determine the specific effects of a particular causal factor, all others must be held constant and the item under investigation must be subjected to isolated alteration in order to determine its effects (*Caus.Puls.* 1.5, IX 10-11 K): thus Galen is well aware of a crucial feature of the experimental method in science, as well as anticipating Mill's canons of inductive inference.

The notion of a *dunamis* here requires further investigation. At *Caus.Puls.* 1.2, IX 4, Galen notes that the fact that the heart and the pulsative capacity operate continuously as long as an animal lives (and conversely that as soon as they cease it dies) makes it evident that they have some vital function, although it is much less clear (and much more controversial) what it actually is. As a result of this, some people choose to speak neutrally of an "incorporeal capacity" which makes use of these organs, whatever precisely it may seek to effect. A 'capacity' is thus a

place-holder for a proper, full-blooded causal explanation, a useful form of words to be employed when such an explanation is not yet available, but by no means a substitute for it.

Elsewhere, Galen makes much use of this talk of capacities or faculties or powers; indeed, *Nat.Fac.* is written precisely to vindicate their postulation against the more naive (as he sees it) mechanism of the Epicureans in philosophy and Erasistratus and Asclepiades in medicine. Capacity-talk of this sort is intrinsically teleological: something has a *dunamis* just in case it has a tendency to promote some *energeia* (the Aristotelian vocabulary is not adventitious); and an *energeia*, as we have seen, is strongly tied to the idea of ends or goals (cf. *Nat.Fac.* 1.2, II 6-7 K; cf. 1.6, II 15 K, on the "formative" or "artistic" capacity). And one of Galen's principal criticisms of his opponents in *Nat.Fac.* is that they either reject teleological explanation altogether (Epicurus), or at best pay lip-service to it (Erasistratus), and that they try to account for everything by means of mechanical principles such as that of *horror vacui*, refusing to recognize the existence of the natural capacities of attraction, retention, propulsion, expulsion, and so on, which are, in Galen's view, peculiar to different organs of the body (*Nat.Fac.* 1.13, II 33; 1.16, II 60-63; 2.1, II 75; 2.3, II 83; 2.4, II 88; 91; 2.6, II 99; 2.9, II 132-134; 3.13, II 187 K). These capacities resist, then, any simple-minded and naïve reduction to simple mechanical principles; but for all that Galen, in the spirit of his agnosticism in regard to the internal causal principle of growth in the foetus, leaves open how they are precisely to be analyzed.

For, as Galen is well aware, assigning capacities to structures in this way is not itself a substitute for scientific investigation:

> All the... capacities fall under the category of relations: they are primarily the cause of the activities [sc. of the various organs] but incidentally of their effects. But given that the cause is relative to something, being the cause of what results from it alone, and of nothing else, it is obvious that the capacity also falls under the category of relation. And so long as we are ignorant of the essence of the activating cause

> we call it a capacity: thus we say that there is in the veins a blood-producing capacity, a digestive capacity in the stomach, a pulse-creating capacity in the heart, and in each of the other parts a specific capacity corresponding to its activity. So if we are to investigate methodically how many and what sort of capacity there are, we need to start from the effects — for each effect comes from a specific activity, and each activity from a specific cause. (**11**: *Nat.Fac.* 1.4, II 9-10 K)[31]

This is of a piece with his rejection of pseudo-synectic causes which are merely re-nominalizations of the effects:

> There are those who say that the heating of the head by the sun is the containing cause of the warmth that results in it, and the cut the containing cause of the wound. But they do so only because they do not realize that they are saying the same thing in different words. For the heating of the head is nothing more than the warmth produced in it... and the wound nothing more than the cut to the flesh. (**12**: *CC* 9.6)

Referring to things as *dunameis* is a preliminary to proper investigation as to their precise natures; and such capacities had better be genuinely separate causal factors. Such a thing is the heart's pulsative capacity. That is has such a capacity is evident; quite why, or indeed how, is controversial (although Galen believes that the pulse is transmitted through the coats of the arteries, and the flow of blood is caused by the expansion and contraction of the arteries rather than *vice versa*).

[31] Compare *Sent.Prop.* 14.1: "Everyone knows that we possess souls, since we plainly see the things that are activated through the body: walking, running, wrestling, the many varieties of perception; and we know on the basis of an axiom that commends itself naturally to all of us that there is some cause for these activities: for we know that nothing occurs without a cause. But because of our ignorance as to exactly what the cause of these things might be, we assign it a name on the basis of its capacity for doing what it does".

So it turns out that this *dunamis*, the physical constitution of the cardio-vascular system, and the *chreia* of the pulse, are all, taken together, the total synectic cause of the alterations of the pulse. At *Caus.Puls.* 1.5, IX 9.18-10.3 K, he writes that all three must "act together" (*sunergein*)[32] to produce swiftness and magnitude of the pulse, "the *chreia* urging on their generation, the *dunamis* being in a good condition, while the coats of the arteries are soft, or at any rate not hard". So the three factors must all co-operate in order to bring about the requisite effect, but the roles they play in it are analytically distinct and distinguishable; and at this point another feature of Galen's creative syncretism, his willingness to adopt a modified Aristotelian taxonomy of causes, comes to the fore.

At *Caus.Puls.* 1.2, IX 5 K, Galen assimilates the pulsative faculty to "the active (*drastikê*), productive (*poiêtikê*), and creative (*dêmiourgikê*) cause of the activity", having just said, echoing text 11, that "we call this cause which creates (*dêmiourgousan*) the pulses, whatever it may be and even if we are ignorant of its essence, a *dunamis* because of its being capable of effecting the pulses" (*ibid.* 4-5). On the next page, he describes the condition

[32] *Sunergein* is cognate with *sunergon*, a word which has a technical sense in causal contexts, although that sense is quite distinct from any intended here. A *sunergon* is something that helps a synectic cause to achieve its result more easily than it would have done otherwise, but is not necessary for its effect (Ps.GAL. *Def.Med.* 160, XIX 393 K seems to imply that a *sunergon* may be individually sufficient for its effect, but this is highly aberrant). Michael Frede (1980, 237-243) argues that the Hellenistic schools know of two distinct causal triads: procatarctic, preceding and synectic causes on the one hand, and *sunaitia*, *sunerga*, and perfect causes (*aitia autotelê*) on the other; but this is over-schematic, and while Frede is himself aware of some of the problems involved in assimilating *sunerga*, or a sub-class of them, to procatarctic causes, I am not entirely convinced by his solution (*ibid.*, 242). CLEM.AL. *Str.* 8, 9, 25 mentions procatarctic and synectic causes, *sunerga* and "prerequisite causes" (αἴτια ὧν οὐκ ἄνευ: cf. PL. *Phd.* 99 b; CIC. *Fat.* 36). At *ibid.* 32, *sunaitia* take the place of the prerequisites, and while Platonic *sunaitia* might be fairly easily assimilable to the prerequisites (see HANKINSON 1998b, 10-13), prerequisites and Hellenistic co-operative causes are clearly different beasts. The upshot is that none of these divisions is systematic; but Galen never mentions *sunaitia* or perfect causes; and he uses the adjective *sunergon*, as he does the verb *sunergein* here, only in a general sense.

of the arteries themselves as being "instruments" (*organa*: *Caus.Puls.* 1.4, IX 6 K) of the outcome. *Aitia drastikê* or *poêtikê* is standard later Greek terminology for the Aristotelian efficient cause;[33] and the talk of instruments prefigures the later Platonists' addition of the instrumental cause (along with paradigmatic cause) to Aristotle's canonical four.[34]

Middle Platonists had already distinguished two categories of final cause, the paradigm and the end (*telos*) in order to make room in Aristotle's scheme for Platonic, hypostasized, independent Forms, as well as their immanent Aristotelian cousins (with the category of the end answering to Aristotle's non-hypostasized final cause).[35] I have found no earlier mention of instrumental causes (they do not feature in contemporary Peripatetic accounts: cf. Alexander Aphrodisiensis, *De fato* 2, Suppl.Arist. II 2, p.166.2ff. Bruns), but Galen does not claim to have invented the category (which in any case has Aristotelian antecedents: drugs are the *organa* by which the doctor effects his cures: *Ph.* 2.3, 195 a 1-3), and it is unlikely that he did so.

[33] There are differences of emphasis, but the coincidences of meaning are more important; BARNES (1983) notes the proliferation of terms for efficient causation in later Greek philosophy (and he misses one or two); and Galen uses Aristotelian and Stoic terminology indiscriminately, frequently in the same context (cf. *CP* XVI 199), which suggests that he at least saw no important distinctions between them.

[34] See SIMPL. *In Ph.* 1.1, CAG IX pp.10.35-11.2; 2.3, pp.309.2-324.4; PHLP. *In Ph.* 1.1, CAG XVI p.6.9ff.; 2.3, pp.241.3-247.18.

[35] I have sometimes wondered whether Galen's occasional distinction between *telos* and *skopos* might be intended in part to mirror this Middle Platonist refinement, with the *telos* as the Aristotelian immanent end, and the *skopos* the goal towards which the individual (or the Demiurge) directs their attention. But Galen does not always make any such distinction (at *CP* VI 57, he explicitly says: "it makes no difference whether you call this [sc. the final cause] that because of which [δι' ὃ: although *CP* survives only in Latin, the Latin is so literal as to permit easy recovery of Galen's Greek] what comes to be comes to be, or its *chreia*, or its *telos*, or its *skopos*": see HANKINSON 1998b, *ad loc.*), and in any case, often when he does (e.g. at *SI* I 64: "The *skopos* of medicine is health; its *telos* is the achievement of it"), he seems to be far more influenced by the role the two terms play in Stoic action theory and ethics. Yet an important text (quoted below: 12) does claim that the *chreia* and the *skopos* are different types of cause; and it may well be that Galen's syncretist desire to answer to a wide variety of different sources leads him into confusion here.

Thus we have the interesting result that the three co-operating synectic causes of the pulse can each be assimilated to elements within the sub-Aristotelian causal categories; and one of them is explicitly that of a final cause. It is often said that synectic causes represent a sub-class of the general category of efficient causation; that no longer seems to be quite the case. On the other hand, Galen himself insists that the distinction between instrumental and efficient causation may be a matter of perspective: at *UP* 17.1, IV 347 K, he remarks that a muscle may be thought of as an efficient cause of movement if we consider it from the point of view of the immediate effect, but when considered in regard to the origin of the action, the soul's volition, it turns out to be simply instrumental (cf. *CP* VII 73: a leg is an instrumental cause of a trampling, although in an obvious sense the leg is clearly *doing* something); thus the distinction is part of what allows the theorist to make analytical sense of sequences of causation which, as we have seen, Galen is particularly concerned to do (and as Aristotle, in general, was not); and instrumental causes (or at any rate some of them) may be thought of as intermediate efficient causes of their effects, but not as efficient causes in the strict Aristotelian sense of being origins of motion. Moreover, again at any rate in some cases, the action of these instrumental intermediaries may be supposed to be contemporaneous with the initial (initial in a causal rather than a temporal sense) efficient cause of the effect in question — and hence they too will meet the basic criteria for being *aitia sunektika*. Even so, instrumental causes are less important than the others: at *CP* VI 67, he describes the final and efficient causes as "primary and most important", with the instrumental and material as third and fourth respectively.[36] And this should

[36] There is no conflict between this claim and that made a couple of sentences later (VII 72) that efficient and material causes are the only ones essential to all cases of causation — it is of course a perfectly Aristotelian notion that some events lack final causes (*Ph.* 2.4-6), and one with which Galen concurs (VII 71); equally some sorts of production do not require instruments (or intermediate efficient causes: VII 71).

hardly be surprising given the scope and cast of his teleology, something made particularly evident by an important passage of *UP* (6.12-13, III 464-471 K), where he lays out his Aristotelian causal categories in their most complete form. Indeed this is the only passage (to my knowledge) where Galen acknowledges the existence of the formal cause at all, and here he does so only grudgingly.[37] Michael Frede (1980, 243) has noted that synectic causes are the Stoic analogue to the Aristotelian formal cause, while Galen held the original Stoic synectic causes to be pseudo-causes of being, not genuine causes of becoming, which in large part accounts for his coolness towards the concept of the formal cause (as also no doubt does his commitment to PCI).

But more important for our purposes is his diagnosis of what he takes to be Asclepiades' error in supposing that the coats of the pulmonary 'arteries' (actually the pulmonary veins) are thin because they work hard, whereas in fact the truth is the teleological opposite: they work hard because they are thin, and are thin in order to work hard (*UP* 6.12, III 464-465). He characterizes Asclepiades' mistake as one of mistaking "a most insignificant cause, one which is not a cause in the strict sense at all, but rather a cause only incidentally", i.e. the instrumental cause, with a proper (teleological) causal explanation. The point, presumably, is that they work hard in order to bring about something else (efficient movement of blood and *pneuma*); and to do that the machinery has been set up in the optimum possible manner — they can best fulfil their function if they're thin. Thus their thinness, which is a necessary condition of their efficiency, contributes to the functioning of the system by allowing them to work hard, and is as such an instrumental cause of its proper functioning.

Here another point of assimilation arises. In the causal sequences of texts **9-10**, the intermediate stages, those which lead from the initial impulse which disturbs the equilibrium of the system to the final synectic cause of the effect in which we

[37] See HANKINSON 1998b, 14-18, 192-200.

are interested, the preceding causes in the terminology of these texts, will also turn out for Galen to be instrumental, although of course as they are neither cotemporal with the effects in question, nor (necessarily, at any rate) functionally correlated with them, they will not qualify as synectic causes of them. But there is another type of instrumental cause, the nature of which Galen discusses at some length in *CP* VI 63-5, VII 68-71 and 77: the instrument or tool in a more literal sense, the carpenter's saw and gimlet (although at *Caus.Puls.* 1.4, IX 6 K Galen appears to assimilate these two types of instrument). These too (or perhaps rather their actions) intervene between the original volition of the artisan and the finished product — but here the emphasis is not on the intermediate events with which they are associated (as in the earlier cases) but rather on the items themselves, and the ways in which their particular structures affect the nature of the outcome (a blunt chisel will produce shoddy carpentry, no matter what the skill of the artisan).

Moreover, while in the passage of *UP*, the instrumental cause is described as 'incidental', at *CP* it is enrolled among the genuine, *per se* causes, along with the final, material and the efficient, and as such contrasted with mere 'incidentals' such as "the location and the surrounding air" (*CP* VII 78-89).[38] The latter "have the status of prerequisites" (84, 89) but are not genuine causes. The language here clearly echoes Plato's at *Phaedo* 99 a-b; but the class of items so classified turns out to be quite different, which in turn emphasizes the distinctiveness of Galen's own conception of causation.

For something to be a genuine cause, for Galen, it must "a thing which of its own nature contributes to something's coming to be"[39]

[38] For a full discussion of the issues raised by this concept of incidentality, see HANKINSON 1998b, 203-206. Aristotle denied that place as such was properly speaking a cause (*Ph.* 4.1, 209 a 14 ff.), although that is hard at first sight to square with his doctrine of natural places. But others (such as the eclectic Potamo of Alexandria: DIOG.LAERT. 1.21) certainly allowed it.

[39] Compare CIC. *Fat.* 34-36: "We should not understand the term 'cause' in such a way as to make whatever precedes something a cause of it, but only what precedes it effectively: thus my going to down to the campus was not the cause

(VII 76; cf. 84).[40] This is not an easy notion to make precise, although intuitively it is clear enough: prerequisites are simply items which are needed, other things being equal, for the effect, but not for any particular properties they might have. Thus in Galen's example, a carpenter needs somewhere in which to work, but there is no particular place in which he needs to be; by contrast, the tools he uses will have a direct impact on the execution of his design (VII 76-80), and faults or inadequacies in them will result in imperfections in the finished products (VI 63-5).

It is evident from all of this that Galen is somewhat careless in his use of the term 'incidental'; but his position itself is not incoherent. In the *UP* passage, he means to devalue the importance of the structure of the arteries by comparison with other, as he sees it more important, causal factors, but he does not thereby impugn its status as a genuine cause, on the *CP* model (their thinness is directly contributory to their operation); while in the latter text he uses the distinction between essential and incidental in a more precise manner.[41]

of my playing ball, nor was Hecuba the cause of death for the Trojans because she gave birth to Paris... For in this account a well-dressed traveller will also be said to be the cause of his being robbed of them by the highwayman... But they [sc. the Stoics] say that there is difference between whether something is such that something else cannot be brought about without it, and whether it is such that something else must be brought about by it. Therefore none of those things is a cause, since none of them brings about the thing of which it is said to be a cause by its own force. Nor is that without which something cannot be a cause of it, but only that which is such that, when it is present, that of which it is the cause is necessarily brought about".

[40] Here as so often Galen appeals to ordinary Greek usage: this is what any ordinary person would choose to call a cause (cf. VI 55-56).

[41] It should be remembered that at *Symp.Diff.* 1, VII 47-48 K, he uses the distinction differently again, to differentiate between proximate and remote causes. But he never deploys the distinction between causes *kath'hauta* and *kata sumbebêkos* as Aristotle does (*Ph.* 2.3, 195 a 26-b 3) to distinguish between explanatorily lucid ways of picking out the appropriate causal factor and those which are not, which is of a piece with his later Greek emphasis on causation as a productive relation holding between types of events and dispositions, rather than on explanation as an intensional, referentially-opaque phenomenon.

Here we may quote from *Symp.Diff.* again, and in so doing return to our earlier theme of the proper analysis of disease:

> Health is a disposition (*diathesis*) productive of a natural activity (it makes no difference, as we have said, whether we say 'condition [*kataskeuê*]' or 'disposition', or 'productive of a natural activity' or 'cause of a natural activity')... In the same way a disease is an unnatural condition of the body which is the cause of the activity's having been harmed (or, more concisely, a disease is an unnatural disposition which impedes an activity). An affection (*pathos*) is a change (*kinêsis*) in the matter as a result of the agent; and this change as a result of the agent is an activity. And what contributes of its own nature some share of the generation for the thing generated is said to be its cause. And they are many in kind: for both the matter and the *chreia* and the *skopos* and the instrument and that whence comes the source of the change are causes. Each of these contributes to the completion of the thing generated. But those which, while contributing nothing, are still not to be separated from the things which do contribute, have the status of prerequisites. (13: *Symp. Diff.* 1, VII 47.4-48.4 K)

Here is another classification of causes, this time distinguishing *chreia* from *skopos*,[42] but making the same distinctions between essential and incidental causes (although not in the same language) which we have been noting, and also reinforcing Galen's unequivocal position that disease should be defined as the disposition which causes the damage to the activity, and not the actual damage itself. Moreover, the emphasis is again on the co-operative nature of causation. All of the causal types have something to contribute; and the effect will not come about (or at any rate will not come about in the same way or to the same extent: Galen is rightly tolerant of distinctions in the fineness

[42] See n.37 above.

of grain of causal ascription) if one or more of them is absent. But crucially, it is not only the various synectic components (*Caus.Puls.* IX 4-6) which have to be present in order for the effect to occur;[43] so too do their relevant antecedents, and equally the material in which the effect is to be produced must be in a suitable condition.

This latter contention is the cornerstone of Galen's causal theory.[44] By making the condition of the patient (in both senses) of equal causal importance to the action of the agent, he seeks to rehabilitate the notion of procatarctic causes against their detractors; indeed, this forms the bulk of the argument of *CP*. Procatarctic causes are at best necessary conditions of their effects (the diseases); but, 'the sophists' (paradigmatically Erasistratus) argue, if X is not invariably followed by Y, then X cannot properly (be called) a cause of Y (*CP* I 9-10, VI 46, VIII 96-114).[45]

That procatarctic causes do not necessitate their effects is readily conceded by Galen.[46] His opponents deny that antecedent heating can be a cause of fever because "only four out of a thousand spectators [at the theatre on a hot afternoon] develop a temperature, and of these only one, rather than all of them, becomes feverish" (II 11; cf. X 126-7); Galen accepts the validity of the case, but refuses to draw the same conclusions from it. The antecedent heating is certainly causally relevant, he thinks, and the fact that it does not affect everybody in the same way is readily explicable in terms of their differential *diatheseis*.

[43] At *Caus.Puls.* 1.5, IX 10.13-16 K, Galen remarks: "There is one method in all of these cases: varying only the cause under investigation, and maintaining all the others in the same state, to make the judgement regarding the alteration of the pulse".

[44] It is not, of course, proprietory to him: Sextus (*Math.* 9.242-243) tries to rebut an argument in favour of the coherence of causation which insists that causes will only affect suitable bodies, on the grounds that this makes the distinction between agent and patient incoherent; Galen's answer would be that the patient too has relevant causal properties that must be included in any complete causal picture.

[45] See HANKINSON 1998b, *ad locc.*, and 31-36.

[46] And also by Celsus, *Med.* Prooem. 58-60.

Some are simply more prone, because of the peculiarities of their internal constitutions, to be affected in such a way (cf. *Caus.Morb.* 2, VII 8-10 K). But the fact that only they are affected does not show that the heat had nothing to do with it, only that it was the heat in concert with something else, the suitability of the material, that brought about the result (*CP* VIII 98-101). This is of course precisely why Galen thinks that you don't infer directly from the procatarctic cause to the therapy (*MM* 4.3, X 242-249 K); you infer to the internal condition in virtue of which the procatarctic cause is able to exercise its effect in this case.

But of course this has no tendency to show that procatarctic causes do not have a genuine causal role to play in the production of diseased in those cases in which disease does in fact supervene. They do, indeed, contribute something 'from their own nature' — they are not merely prerequisites in the way in which place and opportunity are. Thus what unites all Galen's various types of *per se* (as opposed to incidental) cause is that they are all in some sense directly implicated in the outcome, either as being immediately (non-remotely) responsible for it, or as being genuinely (albeit perhaps mediately) contributory to it. And what is characteristic of synectic causes is that they are directly implicated in both senses.

We can now see why Galen calls the material and the efficient causes the only necessary ones: they are always required to make causal sense of any sequence of events (whereas some sequences will lack final causes). Moreover, Galen accepts that causation is a general, and generalizable, relation: properly understood, the whole cause of some effect will always be sufficient (other things being equal) to produce that effect. Thus he does not abandon the notion that causal sequences should be regular — he simply rejects the naive view that *anything* which may be legitimately viewed as a cause must be invariably correlated with its effects (this is where he parts company with Erasistratus); causing is co-operative.

But, crucially, this can even apply to items Galen will call synectic causes; and here he parts company, I think, with all of his predecessors, and at any rate feels his way towards an account

of the causal relation of unprecedented sophistication. Distinguishing between items which are sure signs of some particular condition, and those which are not, but which are none the less proper to it, he writes:

> We have already clearly distinguished between those pulses which follow the synectic causes of necessity, and those which, while proper to them, do not follow them of necessity. Pulses for which there is a single cause of their generation invariably follow it; and such pulses will be perfect indicators of their cause, a vehement pulse of a powerful capacity, a faint pulse of a weak one. But in the case of the others where if many causes do not coincide the generation cannot be effected, we will say that these are proper to their causes, but not that they signify any one of them in particular. In the same way, if a pulse occurs from time to time from a single cause, but not always from the same one, it will be proper to all of its productive causes, but it will not reveal securely any one of them. For it is not the case that if the pulse is fast, then necessarily too will there be strength of the capacity, but sometimes it will be when the *chreia* of the generation of the psychic *pneuma* is greater, sometimes when there is an excess of heat, and sometimes when there is a softness of the instruments, or several of these, or all of them at once. (14: *Caus.Puls.* 1.7, IX 20.11-21.3 K)

Here Galen explicitly disavows the claim, central to all earlier accounts of the synectic cause, that such causes are invariably directly functionally correlated with their effects, or rather that they are so correlated independently of any other factor. Thus, it turns out, not only are procatarctic causes only causes in conjunction with other relevant factors: the same applies (although not in precisely the same way) to synectic causes too. They, too, at least some of the time, are only sufficient in the circumstances for their effects (to adopt the language of J.L.Mackie). And, of course, provided one sufficiently tightly specifies the 'circumstances', all causes will be, in a sense, so sufficient (at any rate

in deterministic systems), which in turn suggests that such a characterization is less than helpful. I think that Galen implicitly at least recognized that fact; and for this reason allowed that synectic causes could be co-operative, and even that they might answer to different categories in the Aristotelian schema. What unites them, and makes them a coherent causal category, is that they are contemporaneous with their effects, and that (again, other things being equal), any alteration in one of the synectic causes is followed, and immediately, by a corresponding alteration in the effect of that cause. Alter the function of the pulse, and the pulse will alter in tandem with it — and similarly with its *dunamis* and with its necessary and immediate instruments. And of course this tightness of relation is true of neither procatarctic nor of preceding causes, no matter how they are to be characterized.[47]

BIBLIOGRAPHY

BARNES, J. (1991). "Galen on logic and therapy", in *Galen's Method of Healing*, ed. by F. KUDLIEN and R.J. DURLING (Leiden 1991), 50-102.

BOBZIEN, S. (1998a). "Chrysippus' theory of causes", in *Topics in Stoic Philosophy*, ed. by K. IERODIAKONOU (Oxford 1999), 196-242.

---- (1998b). *Determinism and Freedom in Stoic Philosophy* (Oxford 1998).

DE LACY, Ph. (1972). "Galen's Platonism", in *AJPh* 93 (1972), 27-39.

---- (Ed.) (1978-1984). *Galen. On the Doctrines of Hippocrates and Plato.* Edition, Transl. and Comm., CMG V 4.1.2, Parts I-III (Berlin 1978, 1980, 1984).

[47] This is a revised version of the paper presented at the *Entretiens*: in conformity with the prevailing conventions, I append a series of questions and answers. But I feel obliged to acknowledge the interventions of Jonathan Barnes, who did not submit a written question, for having forced me to clarify my position on a number of points, in particular in regard to the principle I label PCI.

DILLON, J. (Ed.) (1993). *Alcinous. The Handbook of Platonism.* Transl. with an Introd. and Commentary (Oxford 1993).

FREDE, M. (1980). "The Original Notion of Cause", in *Doubt and Dogmatism*, ed. by M. SCHOFIELD, M. BURNYEAT, J. BARNES (Oxford 1980), 217-249.

---- (1981). "On Galen's Epistemology", in *Galen. Problems and Prospects*, ed. by V. NUTTON (London 1981), 65-86.

---- (1982). "The method of the so-called Methodical school of medicine", in *Science and Speculation*, ed. by J. BARNES *et alii* (Cambridge 1982), 1-23.

---- (Ed.) (1985). *Galen. Three Treatises on the Nature of Science.* Transl. with an Introd. (Indianapolis 1985).

---- (1986). "Philosophy and medicine in Antiquity", in *Human Nature and Natural Knowledge.* Essays presented to M. Grene (Dordrecht 1986), 211-232.

---- (1987a). *Essays in Ancient Philosophy* (Minneapolis 1987: contains all previously cited articles).

---- (1987b). "The Ancient Empiricists", in FREDE 1987a.

---- (1988). "The Empiricist attitude towards reason and theory", in *Method, Medicine and Metaphysics*, ed. by R.J. HANKINSON, *Apeiron* Suppl.Vol. 21 (1988), 79-97.

---- (1990). "An Empiricist view of knowledge: memorism", in *Epistemology*, ed. by S. EVERSON, Companions to Ancient Thought 1 (Cambridge 1990), 225-250.

FURLEY, D.J. and WILKIE, J.S. (Eds.) (1984). *Galen on Respiration and the Arteries.* An edition with English transl. and comment. (Princeton 1984).

HANKINSON, R.J. (1987). "Causes and Empiricism", in *Phronesis* 32 (1987), 329-48.

---- (1988a). "Galien: la médecine et la philosophie antisceptique", in *Revue de philosophie ancienne* 6.2 (1988), 229-269.

---- (1988b). "Galen explains the elephant", in *Philosophy and Biology*, ed. by M. MATTHEN and B. LINSKY, *CJPh* Suppl.Vol. 14 (1988), 135-157.

---- (1989). "Galen and the best of all possible worlds", in *CQ* N.S. 39 (1989), 206-227.

---- (Ed.) (1991a). *Galen. On the Therapeutic Method Books I and II.* Transl. with an introd. and comm. (Oxford 1991).

---- (1991b). "Galen's Anatomy of the Soul", in *Phronesis* 36 (1991), 197-233.

---- (1991c). "Galen on the foundations of science", in *Galeno: obra, pensamiento e influencia*, ed. por J.A. LÓPEZ FÉREZ (Madrid 1991), 15-29.
---- (1992). "Galen's Philosophical Eclecticism", in *ANRW* II 36.5 (Berlin 1992), 3505-22.
---- (1994a). "Galen's Theory of Causation", in *ANRW* II 37.2 (Berlin 1994), 1757-74.
---- (1994b). "Galen's Anatomical Procedures", in *ANRW* II 37.2 (Berlin 1994), 1834-55.
---- (1994c). "Usage and abusage: Galen on language", in *Language*, ed. by S. EVERSON, Companions to Ancient Thought 3 (Cambridge 1994), 166-187.
---- (1996). "Cicero's Rope", in *Polyhistor. Studies in the History and Historiography of Ancient Philosophy*. Presented to Jaap Mansfeld, ed. by K. ALGRA *et alii* (Leiden 1996), 185-205.
---- (1998a). *Cause and Explanation in Ancient Greek Thought* (Oxford 1998).
---- (Ed.) (1998b). *Galen on Antecedent Causes*. Edited with an Introd., Transl. and Comm., Cambridge Classical Texts and Commentaries 35 (Cambridge 1998).
---- (1999). "Explanation and causation", in *The Cambridge History of Hellenistic Philosophy*, ed. by K. ALGRA *et alii* (Cambridge 1999), 479-512.
HELMREICH, G. (ed.) (1907-1909). *Galeni De usu partium libri XVII*, Vol. I-II (Leipzig1907-1909).
KALBFLEISCH, K. (ed.) (1904); repr. in LYONS 1968.
LYONS, M. (ed.) (1968). CMG Suppl.Orient. II (contains *CC* in both Arabic and Latin translation) (Berlin 1968).
NUTTON, V. (Ed.) (1999). *Galen On my own Opinions*. Edition, Transl. and Comm., CMG V 3.2 (Berlin 1999).
SIEGEL, R.E. (1968). *Galen's System of Physiology and Medicine* (Basel 1968).

DISCUSSION

V. Barras: Le passage du traité *Caus.Puls.* 1,1, IX 1-3 K, sur lequel vous attirez notre attention, paraît en effet exemplaire non seulement pour l'analyse de la chaîne causale relativement à l'altération du pouls (cas paradigmatique si l'on considère l'importance de l'examen du pouls dans la pratique médicale), mais aussi dans les différentes situations cliniques. Pensez-vous qu'un 'schéma' similaire, bien que peu ou pas explicité par Galien à ma connaissance, soit également opératoire dans ses expériences de vivisection?

R.J. Hankinson: It's possible; at any rate, everything he does in such cases should be compatible with such an analysis. However, in the cases I think you have in mind, involving neural ligature and section and so on, the point is to discover what immediate results follow from particular interventions — the idea is that if you intervene in the causal process which delivers voluntary motion, say, at any point, then that motion will be affected. Now you can intervene in a number of places, but standardly you will do so at some point in the conduits that carry neural impulses from the brain to the affected parts; those conduits would be, in Galen's terminology, instrumental in supplying neural impulses, and are certainly genuine causes. But I don't see the other items in the scheme (in particular procatarctic and preceding causes) as being of any relevance here. Of course, a lot turns on just how you characterize the effect you're interested in.

T. Tieleman: You say that Galen was aware of a crucial feature of the experimental method, namely the requirement that the item under investigation must be subjected to *isolated* alteration

in order to determine its intended effects (cf. *Caus.Puls.* 1.5, IX 10-11 K). It would be useful to have some corroboration on this point. Do you know of any experimental reports that illustrate this requirement? I myself think of the successive interception of the nerves, arteries and veins connecting the heart and brain, described at *PHP* 2.6, p.148 ff. De Lacy (= V 262-267 K). Here each type of vessel, Galen explains, has to be blocked *in isolation* so as not to spoil the experiment which aims at establishing the function of each vessel. Is this an example of the point you made?

R.J. Hankinson: Yes, I think it is — thank you very much. I'm not sure quite how explicitly Galen signals the methodology in this passage, but at the very least it is implicit there.

V. Boudon: À propos de la définition de la maladie citée notamment dans votre texte n.7 (*Symp.Diff.* 1, VII 50.4-17 K) comme "lésion d'une fonction", je m'interroge sur le fait que cette même définition est donnée ailleurs par Galien avec une dimension supplémentaire, celle de lésion *sensible* d'une fonction (*Ars Med.* 27, I 379.13 K). Convient-il de voir une volonté manifeste d'évacuer la sensibilité dans le passage de *Symp.Diff.*, et si tel est le cas, quelle conclusion peut-on tirer sur le statut de la cause προήγουμενον?

R.J. Hankinson: I hadn't noticed that divergence in definition, but as you say it is there. I'm not sure whether to suppose that Galen means deliberately to suppress the criterion of sensible apprehensibility in this passage, although I cannot see why he should have supposed in the first place that a disease must be manifest to its sufferer; surely it would make better analytic sense to suppose that there could be such diseases, although of course if they manifest no discernible ill effects then there will probably not be much point in treating them (except possibly prophylactically, to prevent them declining to a condition where they are manifest to the sufferer). I'm inclined, weakly, to think

that the criterion of apprehensibility answers to the ordinary language sense of disease, what 'all Greeks think', but that it needn't necessarily be an integral part of the proper analysis. And I'm not sure in any case what difference it would make to the status of the preceding cause, which after all covers a variety of internal conditions, not all of which need be apparent to the patient — but since the preceding cause is not itself the disease, unless I'm missing something here I don't really see why this matters.

J. Jouanna: Puis-je revenir sur la définition de la maladie du texte n.7, et de la distinction entre 'empêcher' et 'léser'? Il ne semble pas que cette distinction soit opérante ici, car la maladie est définie comme ce qui empêche ou lèse *primarily*. C'est cette notion qui importe. À propos de ce texte, je voudrais revenir sur la notion de symptôme. La formation du terme permet de rendre compte de ce que Galien entend: c'est un évènement qui tombe (πίπτειν) avec, en même temps, sans qu'il y ait une relation de cause à effet, mais simplement de concomitance. À ce propos, il me semble que *sun*, qui a dans σύμπτωμα le sens d'accompagnement, prend un sens différent dans *sunektikos*, où *sun* signifie 'ensemble'. Qu'en pensez-vous? Si la cause synectique est celle qui fait 'se tenir ensemble', on comprend qu'elle soit, comme vous le dites, "the cause of the existence of things".

R.J. Hankinson: I had supposed that there was, at least implicitly, a difference between impediment and lesion, in that the latter seems to suggest damage of a permanent, or at any rate of a serious sort, as the former does not. But you are of course right that the significant feature, at least from the causal point of view, of the definition consists in the idea that it is what is primarily responsible for the damage, where 'primarily' of course means 'directly, immediately', and not just 'principally'. As regards the etymology of σύμπτωμα, again you are obviously right, although it should be stressed, as I tried to do in the body of my paper, that while a σύμπτωμα is defined purely in terms

of temporal concomitance, that does not *preclude* there being a causal relation between a symptom and what it is a symptom of — and indeed standardly there will, at any rate for Galen, be just such a relation. Again, you are right about the different sense of the prefix *sun* in the case of *sunektikon* — and this is exactly why the term had the sense it had for the early Stoics, of being a cause of something's continued existence, something which literally holds something together. But again, as I tried to make clear, Galen rejects this sense, and thinks of 'cohesion' is a metaphorical way, as involving the functional dependence, in the ways I specified, of the effect on the cause.

M. Frede: If I understand you correctly, what is interesting about the beginning of *De causis pulsuum* is a development of the notion of a *causa contentiva* as applied to items like the pulse, more particularly to the pulse of a patient in a particular circumstance. The suggestion is that the *aition sunektikon* is constituted by three factors, (i) the *chreia*, (ii) the relevant *dunamis*, (iii) the instrumental cause, but also that the *chreia*, since we are dealing with a particular case, has to be the *chreia* not of the pulse in general, but of the pulse of the particular patient in particular circumstances. One advantage of thinking of the *causa contentiva* in that way is that, thus conceived, it gains in explanatory power. Against this background I have two questions: (i) I wonder to what extent the three constituents (use, power, instrument) at the abstract level are independent explanatory factors, whether, for instance, they can be identified independently of each other; (ii) I wonder to what extent, even when applied to a particular case, they gain sufficient independence from each other to make an explanation in terms of the *causa contentiva*, thus conceived of, more explanatory.

R.J. Hankinson: This is absolutely the crux of the matter. Your questions are tightly linked, and I shall try and answer them together. Of course, there is an obvious sense in which the *chreia*, perhaps here best rendered as 'need', is conceptually, and

indeed actually, distinct from the other factors, and hence *a fortiori* can be identified as such. After all, one function of the pulse is to expel smoky residues. If your temperature is elevated for whatever reason you produce more of them, and consequently there is a greater need, other things being equal, for their expulsion. But evidently the body can have such needs and yet be unable to satisfy them, in this case either because the heart's *dunamis* isn't up to it, or because the mediating mechanism of the arterial system is damaged in some way. It surely isn't the case that, in some viciously circular manner, we can only identify the need in terms of the *dunamis* and *vice versa*. But of course this isn't the whole story, and what matters here I think is whether the need, so identified, can fulfil any genuinely explanatory role, much less one which we would be inclined to recognize as causal. And this of course takes us to the heart of the question of teleological explanation. Galen's teleology, as I stressed, is an amalgam of Plato's and Aristotle's, but crucially he takes over from the former the idea that the structures and organizations of animals' bodies literally reflect the design of a designer. Thus it will be non-trivial for him to say that the reason why the cardiovascular system is constructed the way it is is in order to accomplish such-and-such a goal in the overall running of the animal's body. And if it needs to get rid of smoky residues in order to survive, or at least to function in the optimum manner, then the designer will have seen to it that the animal will have been constructed in such a way as to accomplish this subsidiary task. And this 'fact' — if of course it is one — explains, in a perfectly straightforward sense, why the animal is made the way it is, and why also (which is what matters to us), its functions vary as they do according to variant ambient circumstances. Now, I think conceived this way the goal, or need, or whatever, really can function as a fully-independent, non-reducible element in explanation, and one which moreover *implies* the existence of further facts which are causal in our sense (at any rate if reasons can be causes). This seems to be a distinct advantage of adopting this sort of teleology over

that of Aristotle, where, notoriously, it is hard to make genuine independent room for the final cause. So I think, at least at the conceptual level, the schema is vindicated, and does indeed, as you suggest, potentially at least gain in explanatory power (I say 'potentially', since such styles of explanation will ultimately be acceptable only to the extent to which the background assumptions they rely upon, in this case crucially that of the existence of benevolent, intelligent designer, turn out to be true — which is obviously an empirical question). In sum, then, Galen is aware of the danger of vacuous pseudo-explanation in which the explanans is merely a restatement of the explanandum; and I do not see that in this case he runs the risk of falling foul of his own strictures on the matter.