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« Les maladies héréditaires » : 18th century disputes in France/Les maladies héréditaires : controverses au XVIIIe siècle en France

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Abstract

SUMMARY. — This paper describes and analyses the discussions on the subject of hereditary disease that took place between 1748 and 1800 among French physicians. Two essay competitions which set prizes for dissertations on the hereditary transmission of disease (Dijon, 1748; Paris, 1788-1790) prompted several writers to try and specify the peculiarities of hereditary causes. The publication of a sceptical essay written for the first competition by Antoine Louis was a major cause of concern for medics wishing to preserve hereditary influence as a valid etiological category. Louis' analytical denial of even the possibility of the existence of an hereditary cause led both the judges and the best medical writers who took part in the Paris competition to force the situation towards the establishment of clear criteria for isolating the hereditary cause from other pathological influences. The transition from a humoralist to a solidist view of the human constitution (body) provided the frame within which the different criteria for heredity were discussed. The prize essays of the Paris competition shared the position that hereditary influence was characterized by a latent, prédisposant kind of causation, which could produce some well known phenomena like atavism (or regression) and homochrony. The solidist causes were thought by most to be better candidates for that role. These developments turned out to be crucial for the emergence and strength of 19th century French (and European) hereditarianism, in medicine and other fields.

Résumé

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« *Les maladies héréditaires* » 18th century disputes in France

Carlos LÓPEZ-BELTRÁN (*)

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MOTS-CLÉS. — Hérédité; maladies héréditaires; génération; physiologie.

SUMMARY. — This paper describes and analyses the discussions on the subject of hereditary disease that took place between 1748 and 1800 among French physicians. Two essay competitions which set prizes for dissertations on the hereditary transmission of disease (Dijon, 1748; Paris, 1788-1790) prompted several writers to try and specify the peculiarities of hereditary causes. The publication of a sceptical essay written for the first competition by Antoine Louis was a major cause of concern for medics wishing to preserve hereditary influence as a valid etiological category. Louis' analytical denial of even the possibility of the existence of an hereditary cause led both the judges and the best medical writers who took part in the Paris competition to force the situation towards the establishment of clear criteria for isolating the hereditary cause from other pathological influences. The transition from a humoralist to a solidist view of the human

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constitution (body) provided the frame within which the different criteria for heredity were discussed. The prize essays of the Paris competition shared the position that hereditary influence was characterized by a latent, predisposant kind of causation, which could produce some well known phenomena like atavism (or regression) and homochrony. The solidist causes were thought by most to be better candidates for that role. These developments turned out to be crucial for the emergence and strength of 19th century French (and European) hereditarianism, in medicine and other fields.

KEYWORDS. — Heredity; hereditary diseases; generation; physiology.

« *Un tel est fou, dit-on quelque fois; son pere l'étoit, ses enfans le seront, cela vient de famille, c'est une maladie héréditaire! On hérite donc des maladies comme des biens? Oui sans doute; & un pere laissera à ses enfans tout a la fois sa terre, sa charge, sa maison, son argent & la goute [...] c'est un fond qu'il ne leur est pas possible d'aliéner; il doit passer en ligne directe jusqu'à la derniere génération, et tous les rejettons que produira cette souche vitiée, recevront d'elle, avec principe de la vie, celui de la goute* (1). »

In such tenor — more akin to the darker sentiments of 19th century hereditarianism than to the *lumières* — did J. de La Porte, a French literary critic and editor, describe the 1750 frame of mind of those who took hereditary transmission of certain diseases as self-evident. These, he reckoned, constituted a majority among lay persons, and nearly all medical men.

In the article in question (2) La Porte, as editor of *Observations sur la littérature moderne,* had given a recent small booklet by a novice author on the rather specialized and relatively marginal subject of hereditary disease, the rare privilege of being reviewed, and commended alongside recent publications from mainstream French literary and intellectual authors such as Voltaire, Maupertuis or Montesquieu. Apart from pointing out the unusual clarity of ideas and elegance of exposition of the then very young,

(1) See n. 2, below. In English : « This one is mad, we say; his father was too and his children will also be mad, for it runs in their family, it's an hereditary disease! Are diseases then inherited like property? Yes, no doubt about it; a father will leave the whole lot to his children; his land, his post, his house, his money and the gout [...], it is a patrimony impossible to forfeit; it has to be passed in direct line up to the very last generation, and all the progeny of this vitiated source will receive, with the principle of life, that of the gout. »

(2) J. de La Porte, Dissertation sur les Maladies Héréditaires par M. Louis, *Observations sur la littérature moderne,* t. 3 (Amsterdam : chez Pierre Mortier, 1750).

author, Antoine Louis (3), the reviewer justifies this inclusion by emphasizing the importance of the subject for wider spheres than solely the medical, given that it could affect not only individual families, but whole nations and for great spans of time.

But perhaps the most attractive feature of Louis' small dissertation was that it argued against the tide of opinion questioning the very existence of hereditary diseases, boldly calling into question centuries of assumptions and presuppositions, and of accumulated statements of fact, very dear to the medical profession. As Louis in fact challenged the reality of the transmission of any individual (non-essential) characteristic from parents to children, his scepticism extended to everything « hereditary » within the physical realm. The belief in physical causes of things like family resemblance, hybridization, and the transmission of deformities (or monstrosities) within families became unacceptable under his critical position.

This went against what most 18th-century medics considered to be very well established facts, strongly backed by most authorities within the dominant Hippocratic-Galenic tradition in medicine, and by their own day-to-day practice. It can also be said that, as part of their overall theoretical approach to physiology and disease, medics had very high stakes invested in the reality of such phenomena, and they did not take lightly any such challenge.

Alexis Pujol (1739-1804), a physician at Castres, wrote some time later that Louis' essay had been more popular among amateurs than among professional medics. The latter had found his points witty but unconvincing, preferring to ignore him and carry on with the business of unriddling the very complex affair of hereditary influence in disease. These professionals were convinced (as

(3) Antoine Louis (1723-1792), was soon to become an important contributor, mainly on surgical matters, to Diderot's *Encyclopédie*. Later in life he became permanent (and polemical) secretary to the Royal Academy of surgery (1764-1792), and among many other things was the co-designer of the infamous « *guillotine* », which for some time was known as the « *petite Louison* ». Bio-bibliographical information on him is summarized under Louis Antoine, in F. & S. Kafker, *The Encyclopedists as individuals* (Oxford : Voltaire Foundation, 1988). See also P. Sue, Éloge de Antoine Louis (1793), in Antoine Louis, *Éloges, 1750-1792,* lus dans les séances publiques de l'Académie royale de chirurgie, E. Dubois (éd.) (Paris : Baillière, 1859), 416-449; and H. Zeiler, *Les Collaborateurs médicaux de l'*Encyclopédie (Paris : L. Rodateri, 1934).

they might be given the immense power of accumulated evidence) of the reality of the phenomenon in question (4).

The truth, if we are to believe the statements of several other late 18th-century French physicians (5), is that the inclusion of Louis' dissertation in a widely-read and discussed journal did put some pressure on the French medical community to produce a clearer account of hereditary transmission. Pujol himself ends up recognizing such pressure in affirming that when, in 1787, the French Royal Society of medicine decided to establish an essay competition on the theme of hereditary diseases (prompting the production of his own essay) it did so because it regarded as « *douteuse et problematique l'existence de ces maladies* ». This can be inferred from the wording of the essay questions (6). As Pujol writes :

> « *Il est donc clair que la Société n'avait en vue que de réunir de grandes preuves contre les assertions hassardées autrefois par M. Louis* (7). »

Louis' essay itself had been written in response to an essay competition forty years earlier. To some details of the first essay competition, established by the Dijon Academy, and the argument of Louis' sceptical essay, I will now turn.

Antoine Louis' sceptical challenge

In 1748 (only a couple of years before Rousseau's first polemical participation in an Academy of Dijon competi-

(4) Alexis Pujol, Essai sur les Maladies Héréditaires, in Boisseau (éd.), *Œuvres médicales de Pujol* (Paris, 1923). There are manuscripts versions in the archives of the old Société royale de médecine at the bibliothèque de l'Académie de médecine, in Paris. They are classified as SRM : H, and 200-2-8.

(5) Prominent among them, the historian of medicine and physician at Montpellier, Pierre-Joseph Amoreux, who in an unpublished essay (SRM : I and 200-2-2) recognizes the persuasiveness of Louis' arguments. This effect of Louis' arguments lasted well into the 19th century when different readers, like Prosper Lucas — in his *Traité de l'hérédité naturelle* (Paris, 1847-1850), or Charles Elam in *A Physician's Problems* (London, 1869) — believed it necessary to address them.

(6) See section « Responses to the sceptic », below.

(7) Pujol, *op. cit.* in n. 4, 214.

tion) (8), another much less well known dispute had originated in a similar context. In one of the first essay competitions with a medical theme in the history of the Dijon Academy (9), an essay question was chosen that, although based on a particular (and traditional) medical issue, was at the crux of several physiological debates, then in progress : it was moreover one which was seen by some as having important consequences for the understanding and treatment of some of the most dramatic diseases of the time. The question was « *Comment se fait la transmission des maladies héréditaires?* » and the polemical contribution, written by Antoine Louis (in contrast with Rousseau's case) was not even mentioned by the judges in their final assessment, perhaps because his essay did not try to answer the question (10). Instead, in what Pujol later called « *la dernière insurrection qui s'est faite contre la transmission héréditaire des maladies* (11) » Louis set himself up to challenge the basic assumption on which the essay question depended, *i. e.* the reality of such transmission.

To justify his attitude, Louis gave the example of Daniel Bernouilli's prize winning essay of 1724 for the Academy of sciences of Paris, in which instead of answering the question set by the academicians, he showed that the phenomenon which they wanted explained (the transmission of movement between rigid bodies) never takes place because the very existence of such bodies is impossible. Louis offered to do the same for his subject, though he acknowledged that a question of medicine, related to practice and empirical evidence, is not exactly in the same category as the physical problem he quotes. He believes, however, that to inspire legiti-

(8) See A. Tisserand, *Les Concurrents de J.-J. Rousseau à l'académie de Dijon* (Paris, 1950). Also Jacques Roger, Introduction to Rousseau's *Discours sur l'origine et les fondements de l'inégalité parmi les hommes* (Paris : Flammarion, 1971).

(9) The first essay prize ever of the Dijon academy was set in August 1741, and the theme was a problem in physics, after which the prize was alternated yearly between moral, medical and physical questions. See for details on this the Histoire de l'académie de Dijon, in *Mémoires de l'académie de Dijon,* t. I (1759). See also R. Ruffey, *Histoire secrète de l'académie de Dijon* (Paris, 1909).

(10) Louis was then a relatively unknown, very ambitious, 25-year-old, military surgeon. Pujol wrote about his motivations : « ... *fort jeune encore [il] avait besoin de se faire un nom par quelque Écrit éclatant, s'amusa a fronder le programme de Dijon, par une Dissertation très-ingénieuse qui fit de bruit, et tira tout-à-coup son auteur de la foule des Écrivains.* » *(Op. cit.* in n. 4, 212-213.)

(11) *Ibid.,* 212.

mate doubts concerning the question proposed is as valid as trying to answer it.

The judges of the competition, to whom Louis addressed all the clever, sceptical doubts of his essay (in a rhetorical, as well as rational attempt to bring them to change their opinion) were obviously not convinced; they awarded the prize to Chambon, a physician and lecturer at Montpellier, and gave two special mentions to provincial medical men : Guillaume Rey of Chaumont (in Lyonnais) and Gravier of Parray (in Charolais). All three of them participated with « positive » contributions (12).

The young Louis felt strongly that justice had not been done, and decided to publish his essay the following year, with a challenge to the winners to publish theirs and to the judges to confront what he felt to be his insurmountable argument against the very existence of hereditary disease (13).

(12) Probably one of the principal judges of the competition was Lecat, a surgeon with whom Louis had had a heated priority dispute only a couple of years earlier. I do not know if this could have affected the decision, because the work must have been submitted anonymously. Lecat is also known to have opposed the granting of the prize on morals to Rousseau in 1750. See the *Histoire de l'académie de Dijon, op. cit.* in n. 9. There is a possibility however that the prize was not judged fairly at all. Ruffey, in his *Histoire secrète de l'académie de Dijon* (which remained unpublished until 1909; see n. 9 above) made very severe accusations concerning the adjudication of the Dijon prizes during the period in question (1741 and onwards), specially those concerning medicine. I copy from his text : « *Dans l'une des séances publiques on distribuait chaque année un prix de la valeur de trois cents livres [...] pendant quinze années [1841-1856] presque tous les prix, surtout ceux de médecine et de physique, furent donnés par faveur et par intrigue à des gens qui prêtaient leur nom à un médecin de l'Académie auquel ils abandonnaient la valeur du prix...* » Ruffey, himself a member of the Academy in those years, identifies the perpetrator of the mischief as M. Fournier de Languedoc, who apparently was caught *in fraganti* in the midst of one of his schemes. Unfortunately Ruffey omits the details of the prizes that were bent, and I have no information as to whether the documents still exist in Dijon.

(13) Antoine Louis, *Dissertation sur la question ... comment se fait la transmission des maladies héréditaires?* (Paris : Delaguete, 1749). About Louis' own attitude towards the truth of his pronouncements there is some discussion. Judging by the wording and the tone of his introduction to the published essay, he seems very strongly committed to it. Most medics however believed he had been cynical in his will to ignore the most obvious facts of « the hereditary ». Amoreux thought that Louis had softened his position later in life, and La Porte, who seems to have had personal links with him at the time, wrote : « *M. Louis ne regarde pas ce raissonemment comme invincible, & l'on voit bien ce n'est que l'envie d'avoir de plus [amples] eclaircissemens sur cette question importante de la Médecine.* » Among the winners of the Dijon contest, only Rey published his competition piece (1749), and the « silence » of the winner probably confirms Ruffey's accusations (see n. 11).

Do the « *maladies héréditaires* » really exist? Louis asks, going on immediately to question the automatic « yes » given by all physicians of his time. He writes :

« Il [n'est] presque parlé des maladies héréditaires que par simple dénomination, dans la division générale des causes des maladies : peu d'Auteurs insistent sur la cause héréditaire dans les details pathologiques. Cette cause seroit-elle un être de raison, un vice imaginaire dont on ne parle que par habitude & sans conoissances positives? »

All authors, including the other competitors for the Dijon prize, (Louis blatantly affirmed), go straight on to answer how disease is communicated from parents to offspring, without giving a second thought to the reality of the phenomenon. The discord between them is about particular routes and media of transmission, and is based on their allegiance to this or that school or practical tradition in medicine. It seems indeed strange to him that the very existence of hereditary disease has, in itself, been admitted by physicians of all schools and at all times (14).

The attitude of trying to explain something that nobody had even bothered to prove the existence of, is compared by Louis to the discourses of those savants of old who tried to explain why some underground places were hot in the winter and cold in the summer, without ever taking the trouble to verify such a statement (15). He professes to have tried to discover the motives that have persuaded so many generations of physicians and authors of the existence of such a kind of « *transmission morbifique* ».

« Je n'ai apperçu sur ce point que des allégations vagues, qu'une tradition reçue aveuglement & transmise de siècle en siècle, sous l'autorité des quelques faits particuliers, dont les différentes circonstances paroissent n'avoir point été assez exactement observées (16). »

Authors, Louis argues, blind themselves when they can hold in their imagination an idea that seems to link everything together by supposed causes, and cease to see all the inconsistencies surrounding the matter. He believes that to hold theories as dearly as most physicians do is deleterious, usually impeding the acquisition of real, empirical, detailed knowledge. The error is to believe

(14) Louis, *op. cit.* in n. 16, 7-8.
(15) He quotes for this Fontenelle's *Histoire des Oracles*.
(16) Louis, *op. cit.* in n. 13, 9-10.

that one can avoid burdening the memory by having general recipes for all circumstances; that one needs only to « have the thread » in order to master « all the ideas » (17).

To answer the basic question of the existence of hereditary diseases, Louis first wants to establish what we are to understand by the adjective « hereditary ». He refuses to use the adjective only on the basis of a familial pattern of occurrence (18). An example of this common mistake, he believes, is in saying that venereal diseases (*i. e.* the communication of a « *virus vénerien* ») are hereditary, just because the baby is infected at birth, as the mother is. Given the mutual communication of « *liqueurs* » between mother and embryo, the vices of the mother's humors will necessarily influence the child's health. Furthermore, this kind of communication of disease is no different from the one transmitted through the milk during lactation, either by the mother or by a nurse, neither of which should properly be called hereditary (19). These must certainly be considered, he writes, among the contagious diseases, whose routes of contagion are not exclusively familial ones. Surely, Louis concludes, if we are to use a special category for hereditary transmission it must be backed by the existence of an autonomous and independent route of communication, which is carried on to the future embryo by the seed or germ itself through which life is communicated (20). The burden of proof is then upon those who believe such a thing.

(17) A point must be made here concerning the possible motives of someone in the position of Louis. As a surgeon, he had an interest, at the period, in making his profession as reputable as that of the medical men, which it was not, yet. During his lifetime he struggled and achieved, together with other surgeons, a comparable status for his branch of the profession, but struggles and divisions always existed between surgery and general medicine. Many of his writings were aimed at levelling down the theoretical general claims of other physicians and advancing the more empirical, detailed approach of surgery. To accuse most physicians of living in a confused world of theory laden, facile and subjective explanations, was harsh but in tune with this general aim.

(18) « *Je ne donnairai point,* he writes, *avec quelques Auteurs, ce nom à certaines Maladies que les enfans apportent en naisant & dont les parens son actuellement attaqués.* » (Louis, *op. cit.* in n. 13, 12.)

(19) *Ibid.*, 13-14. John Hunter, famously proved that contagion during birth was the reason for infantile syphilis. He also differentiated this communication of disease from the hereditary one.

(20) Mistrust about any solely humoral physiological explanation of constitutional disease was on the rise in Louis' days, and being a surgeon seems to have made him sympathetic to the solidist account. Preformationism, the view of generation which had dominated the first half of his century also was biased toward solidism, and was interested in diminishing the relevance of hereditary phenomena, as the cases of both Louis and Haller show. See below.

Louis goes on to ask himself if what some physicians call the *succession* of disease in families (as distinguished from their *acquisition* of them) really does have an independent, particular route. To answer this question he first explains that the most careful authors do not think that it is the disease itself which is transmitted to children but rather a *disposition* to the disease, which is, in any case, the proper target of the adjective « *héréditaire* »,

« *ensorte que les parens peuvent l'avoir reçue de leurs ayeux & les transmettre à leur posterité sans avoir eux-mêmes jamais été attaqués de la maladie que cette disposition pouvoit produire; parce que leur tempérament particulier, & les différens usages qu'ils ont faits de choses non naturelles on pû changer cette mauvaise disposition (21)* ».

With this move Louis brings to the forefront what had been, up to then, considered by several authors the main mystery of general (not only pathological) hereditary transmission of physical and moral characteristics (the sum of which was the constitution, or temperament of the individual). It had also been considered to be the most important criteria for the recognition of the phenomena : namely atavistic regressions, or generation jumps.

The existence of hidden (latent) morbific causes of the sort that could account for the atavistic pattern, was then put under scrutiny by Louis. Under such a view of the hereditary, he writes :

« ... *le vice héréditaire, s'il y en a, doit se trouver dans le germe antérieurement à sa fécondation; & [...] differents causes extérieures dont les modifications peuvent être infiniment variées, pourroient substituer la succession, & ne la transmettre, par ex., qu'à la centiéme génération* (22). »

Louis, in a sense, tries to turn the argument around. If such hidden causes will only take effect with the concurrence of external causes, the disposition could properly be known to have been in

(21) Louis, *op. cit.* in n. 13, 18. « *Les choses non naturelles sont six,* writes Louis : *l'Air, les Alimens, le Travail & le Repos, Le Sommeil & la Veille, les Excrétions retenues ou évacuées, & les Passions de l'Ame.* » (Footnote, page 18.) Louis is of course here following the old Hippocratic distinction between natural and non-natural influences on health; but in this context, seeing the « non-natural » (external) ones considered as triggering of, or complementary to, hereditary dispositions, one is tempted to relate the distinction with the much later one between nature and nurture; a temptation which perhaps should be resisted.

(22) In referring to the pre-conception state of the embryo as « germ », Louis is assuming a preformationist view of generation. He later pretends, however, that his argument worked both according to preformationist and epigenetist premises.

place only when the disease develops, so one could never be sure that it had a hereditary origin. It cannot be said either that a general tendency was shared by a whole family lineage, unless it could be proved that similar external conditions cannot have been the cause of similar patterns of ill health (which to him seemed impossible). Given that external factors obviously exist, are extremely numerous and complex, and so clearly play a much stronger causal influence than any supposed internal disposition, Louis argues, there seems to be no reason to make use of the latter anyway. The hypotheses of hidden causes were a dubious approach in principle.

Louis finds a further reason for scepticism in the actual embodiment that any hidden, constitutional influence (cause) could take in order to exist in the germ before impregnation. A perfect knowledge of this question would require a much better grasp of what actually occurs during conception, and what the word generation really means. In his lifetime and for some time after, Louis adds, these things are bound to remain a « *mystère impenetrable* ».

Louis however does incorporate some general considerations about generation (reproduction) to back his sceptical approach to hereditary transmission. Basically, what he tries to argue is that no particular (individual) characteristic can be communicated by parents to the first rudiment of the embryo, and that all the so-called hereditary phenomena are caused by external influences. The idea of a transmission or communication of the disposition to a given disease (or any other accident or particularity) is thus simply an illusion originated by the fixation of minds in the deceiving familial pattern of resemblances and recurrences.

In order to develop this part of his argument, Louis considers the two basic alternatives within the disputes over reproduction (generation) : individual germs are either formed one after the other one, in epigenetic succession, or they are all formed simultaneously. In the former case « *le germe de fils doit sa formation à la vertu productrice de son pere* », while in the latter « *le premiere homme contenoit tous [ceux qui] sont sorti de lui* » (23).

In preformed germs all constitutional alterations (that could predispose to disease) are necessarily posterior to the first forma-

(23) It seems clear that though worded in male-oriented terms, this argument applies to both ovist and animalculist preformation, and to the hypothesis of male and (or) female *semen*.

tion (they cannot be attributed to the Creator), so that the issue of hereditary transmission as he had previously defined it, does not make any sense.

In successive generations, Louis argues, any conceivable transmission is made by a restricted portion (the generative one) of the parent's organization, so there is no way a grandparent could actually and particularly affect the organization of the grandchild (24). By making this point, Louis dispels what for many medics was one of the main peculiarities of hereditary influences, namely their *latency,* or capacity to remain hidden in the individual's constitution for some time, or through several generations. In any case, Louis writes, to conclude this part,

« les desordres de l'oeconomie animale doivent s'acquerir particuliérement par chaque homme : toutes les maladies seront individuelles puis qu'elles doivent être postérieures a la formation des germes qui n'ont reçu aucune altération dans leur principe ».

What lies then at the root of Louis' scepticism is his strongly held belief that only general, non-individual characteristics are acquired by the new being through the act of generation : all the contingencies of individual differences (and similarities) are a product of the interaction of this « essential » germ (preformed or not) with its environment, starting with the maternal nutrition during pregnancy. All idiosyncrasies are thus pushed, by Louis' argument, outside of the possible reach of the hereditary. The belief (passed down by the medical tradition) in an hereditary communication of temperament or constitution was, of course, at the basis of most medical men's unquestioned acceptance of hereditary transmission of certain (constitutional) diseases; it was in consequence the target of Louis' most skilful and rhetorical (as well as heretical) paragraph :

« Le tempérament des enfans qui naissent d'un même pere, & d'une même mere est presque toujours différent; les uns son bilieux, les autres sanguins; les uns son guais, les autres sérieux, pésans : ces différences d'humeur, de caractere et d'inclination dans les freres et soeurs, sont des suites de la différence des tempéramens; et elle depend peut-être moins

(24) Louis is here ignoring the traditional argument that has come to be known as « pangenesis », that is, that all the parts of a parent's organization contribute with causal (or material) elements for the constitution of the offspring.

de la constitution primitive ou radicale, qui paroît devoir être la même dans tous les enfans; que d'une disposition acquise par la combinaison infiniment variée de toutes les choses extérieures (25). »

Among the exterior influences Louis mentions the weather at birth, the suffering during birth, the amount of blood in the vessels at birth, the quality of the nurse's milk, the thickness of the air that was breathed during the first hours, etc. *(« On ne finiroit à faire l'enumeration. »)* No wonder, he writes, that there are different temperaments within the same family.

Like most physicians of his time, Louis believed the source and beginning of all illness resided within the individual's temperament, because it makes the person more or less susceptible to the effects that morbific causes can produce. Diversity of temperament is responsible for the differences of individual reaction to contact with such causes (26). If such « *diversité des tempéramens n'est point héréditaire,* Louis asks, *comment les maladies qui en sont les suites pourroient-elles se transmettre par les parens* (27) »?

Louis admits that there are several diseases (like gout, stone and phthisis) that follow a striking familial pattern of occurrence, and he understands the naive movement of many simple minds in ascribing a hidden causal link to account for their transmission from parents to their offspring. But, he says, all those cases can be more accurately described and explained by external causes. He chooses as an example the well-known example of Montaigne's bladder stone. The French essayist shared the infirmity with his own father and used the experience to raise his precisely worded inquiry concerning the power of nature to achieve hereditary transmission of such complex things through a medium as simple as

(25) Louis, *op. cit.* in n. 13, 35. This part of Louis exposition was obviously shocking to many orthodox physicians within the Hippocratic-Galenic tradition. Most of Louis' critics a few decades later concentrated their attack on this fundamental assumption of temperaments as secondary and accidental; as I have said, these paragraphs preserved a lot of their provocative power for several decades.

(26) The humoral-solid physiological explanation Louis gives for this diversity goes as follows : « ... *l'action des fibres plus ou moins forte & vigoureuse, façonne & modifie différemment les humeurs de notre corps; ces humeurs agissent suivant leur quantité sur les solides dans lesquels elles sont contenues, & elles en determinent diversement les actions : de-là viennent les complexions particulieres qui mettent tant de différence entre les hommes, tant par rapport aux dispositions du corps qu'aux caracteres de l'esprit.* » (Louis, *op. cit.*, in n. 13, 36.)

(27) Louis, *op. cit.* in n. 13, 37.

a drop of *semen* (28). Louis asserts his disappointment with Montaigne, because having seen the difficulty, the near-impossibility of such transmission through a stable « sign » in something as amorphous as *semen*, the latter nevertheless chose to believe in a quasi-miracle. The fact that only Montaigne among his many brothers received the legacy, and that the communication occurred 25 years before his father realized he had the stone, should have warned him off such an explanation, Louis argued. It is much more natural, he says, to imagine that the same combination of external influences, diet, habits, etc. was acting upon both father and son, who also shared a disposition to the disease for the same or different external reasons connected to their very first moments of existence. Cases of gout and phthisis are similarly explained away by Louis as non-hereditary.

Two factors are repeatedly used by him in these examples to point out the absurdity of an hereditary hypothesis : the irregularity of transmission (some children are affected by the same diseases as parents but most are not) and the length of time that elapses since the postulated causal communication and the actual development of the diseases.

In his final attempt, Louis tries to invalidate the two possible physiological, non-external routes of disease communication between parents and offspring. Not surprisingly, the two kinds of hereditary causes of disposition to disease that Louis can imagine are, on the one hand the humoral, and on the other, the solidist.

Humoral hereditary vices are discarded by him for several reasons. It seems unlikely that they would not destroy such a fragile thing as a germ. Beside that, one inherited morbific humor would conceivably produce a whole variety of different diseases in several parts of the body at several times and in several circumstances, so the pattern of the same and only disease in the same family claimed by some hereditarians would seem unlikely (29). To add

(28) « *Quel monstre est ce,* wrote Montaigne, *que ce goutte de semence, de quoi nous sommes produits, portes en soi les impressions, non la forme corporelle seulement mais des pensemens et des inclinations de nos peres? et comme portent elles ces resemblances d'un progrés si temeraire et si déréglé que l'arriere-fils répondra à son bisaïeul, le neveu à l'oncle.* » (*Essais* (Paris : La Pléiade, 1978), livre II, 37.) See also A. F. Corcos, Montaigne's insight in questioning heredity, *Journal of heredity,* 64, (1963), 50.

(29) This point was actually made « positively » by several humoralists before and after Louis' essay, in order to try and reduce all hereditary diseases to one, or a few causal (morbific) humours. The climatic moment of this position seems to have been its defense by as important a physician as Antoine Portal, early in the 19th-century, in his *Considérations sur la nature et le traitement des maladies de famille et des maladies héréditaires* (Paris, 1808).

to the confusion, many different humoral influences could conceivably produce the same kind of symptoms and effects. Such an unruly set of possibilities, Louis adds, is so confusing that one would have to use freely some « *privilége de deviner, pour assurer qu'une telle maladie est ou n'est point héréditaire* » (30).

When considering the solid communication of disposition to disease, Louis finds it difficult to believe in any latency whatsoever. Any « hereditary » disposition based on malformation of solid parts, would be manifested immediately. Could an organ, he asks, work well for 50 years if it were badly built?

Worst of all for any solidist defence of the hereditary, there is no way to really visualize the transmission between solid, organized parts. Furthermore, there are very many cases, well known and authenticated, of patently defective individuals (with diffformities or mutilations of solid parts) who had given birth to healthy children (blind parents with sighted children, hunchbacks with normal ones, etc.). Such cases seemed to be the rule rather than the exception. If the constitution of the solid parts of the parent really did as a rule have hereditary effect upon those of the child, how was one to explain such constant failures of the influence? And in any case, there was no easily conceivable way through which a physical flaw could affect the germ.

« *Ainsi, je pense* — Antoine Louis concludes — *que quand on sçauroit par révélation qu'il y a véritablement des causes héréditaires de maladies, il n'y auroit point de connoissance plus stérile, suivant ce que nous venons de dire sur la production d'une maladie par des causes différentes, & sur le déguisement d'une cause sous différens effets; pernicieuse fécondité, dont nous ignorons entièrement les bornes* (31). »

Louis added in a note to the judges for the prize that his work was no doubt relevant to the question raised by the Academy, and therefore should not be excluded; moreover, if his reasons should be considered of any weight, all the other, positive, works were invalid. The judges as we said were not convinced, or they had, as Ruffey suggests, made up their minds beforehand.

(30) Louis, *op. cit.* in n. 13, 50.
(31) *Ibid.*, 51-53.

THE ANTECEDENTS TO LOUIS' REVOLT

When publishing his essay, Louis incorporated as an appendix a long commentary on Robert Lyonnet's *Brevis Dissertatione de morbis hæreditariis* (1647) (32). This text, Louis claims mistakenly, was the only previous one, in modern times, which had the subject of hereditary disease as its main topic. He also claims to have been surprised by the coincidences between his arguments and those of Lyonnet, who like him is sceptical about humoralist claims concerning hereditary transmission, and who would only accept a solidist cause as truly hereditary. That is to say, that only solid parts (organs, tissues) can be both the seat and the cause of a hereditary disease, and its transmission to a descendant has to be seen in terms of a solid-to-solid relationship. If to this premise, one adds the fact (which Lyonnet had ignored) that there is no conceivable solidist causal link between the parents' bodily frame and their offspring's, the conclusion follows that there is no such thing as hereditary transmission.

There seems in effect to have been among European physicians a previous « revolt » against hereditary transmission of disease very early in the 17th century, which shared with Louis's the mistrust of the excesses of 16th century humoralists and their uncritical resource to morbific vices. Alexis Pujol gives an account of this revolt, which he took from a testimony by an outraged François Ranchin. At the time (early 17th century), Ranchin was « *chancelier* » at the medical school of Montpellier. Some medical men had gone to the extreme, Ranchin wrote, of denying « *absolument* » that any disease could be transferred hereditarily. Ranchin was so persuaded that those medical men were mistaken (Pujol adds) that he was prepared to maintain that they were defending such a view against their own inner conscience, with perverted motivations such as the desire for fame and notoriety, and not in a disinterested pursuit of truth (33).

The revolt that worried Ranchin so much was probably related to the specualtive excesses of physicians like Jean Fernel (1497-1558),

(32) Lyonnet was the physician of the king Louis XIII. His dissertation on hereditary disease was written, apparently, to « *tranquilizer l'esprit* » of the queen, regarding many diseases of their son, the future Louis XIV. It was published in Paris, with 87 pages in-4°.

(33) Pujol, *op. cit.* in n. 4, 238.

who perhaps was the most influential writer on physiological and pathological themes of his age (34).

With the advent of these sceptical challenges, early 17th century authors gave increased attention to the hereditary transmission of disease, *per se*. The historian Amoreux describes it as a sudden outburst of publications of treatises with « *hæreditarii morbi* » (or a variant of that formula) in their title (35). Where all previous authors had treated the subject in their more general discourses on generation or pathology, from the early 17th century on special volumes were dedicated to hereditary disease. Contrary to what Louis wrote, Lyonnet's 1643 treatise was not an exception; there were various other authors who reacted against the extremes of humoralists and spiritualists, and their appeal to morbific virtues and faculties, and who tried to develop material, mechanicist (solidist) alternatives for the phenomena of hereditary transmission (36). Workable (picturable) transmission mechanisms based on solidistic causes (or in a combination of these with humoral ones as in iatrochemical hypotheses) were proposed and their influence lasted until well into the 18th century. Many of these treatises, for instance, were consulted in the 1750's by the encyclopaedist (most probably Diderot) responsible for the entry under « *Héréditaire (Maladie)* » and commended as very

(34) J. Fernel, *Les 7 Livres de physiologie* [translated from Latin] (Paris, 1655), 775 p. Fernel's complete medical writings had 97 editions from 1554 to 1680, in Latin and in different European languages. For an evaluation of his work see Jacques Roger, *Jean Fernel et les problèmes de la médecine de la Renaissance,* Conférences du palais de la Découverte, série D, 70 (Univ. de Paris, 1964); and L. Figard, *Un médecin philosophe au XVI^e siècle, étude sur Jean Fernel [1903]* (Genève : Slatkine Reprints, 1970).

(35) A cursory look at the appendix 1 included in my Ph. D. thesis (« Human Heredity, 1750-1870 », King's College London, 1992) will show how justified Amoreux was in using the expression. This appendix gives and comments upon all the bibliographical references to works on hereditary disease between 1586 and 1886 I could find.

(36) After 1594 and before Louis' essay, at least three dozen dissertations on the theme had been published in Europe. Several of them were written by influential authors, for instance Ludovico Mercatus [Luis Mercado], *De morbis hæreditariis liber,* in *Opus,* 2 tomes (Madrid, 1594). Other editions of the two volume work are 1605 in Valladolid, 1608 in Francfurt and 1669. Dermutius de Meara, *Pathologia hæreditaria generalis sive morbis hæreditariis* (Dublin, 1619), in-8°; also (London, 1665), in-8°, and (Amsterdam, 1666), in-12°. Robert Lyonnet, *Brevis Dissertatione de morbis hæreditariis* (Lion, 1647 or 1643), in-4°, 87 p. Frideric Hoffmann, *Dissertatio de affectibus hæreditarii, illorumque origine* (Hal., 1699). Georgi Ernesti Stahl, *Dissertatio inauguralis de hæreditaria dispositione ad varios affectus* (Hal., 1706), in-4°. All these can be counted amongst the most important of them. See appendix 1 in López-Beltrán, *op. cit.* in n. 35, for a complete list and comments.

useful by him (37). Perhaps the most influential and clear of them was written by the Irish clergyman Dermutius de Meara, who synthesized most of the clarifications gained by 16th century authors and managed to develop a very convincing argument in his (1619) *Pathologia hæreditaria* (38).

One of the main intentions of Meara's treatise was to attack Fernel's view that all diseases are, or can be, hereditary and to return to the position of the ancients that only those diseases that depend on defects of the organized solid parts (organs and tissues) are communicable in a hereditary way (through the *semen*) (39). No unorganized disease part (like a tumour or an ulcer), nor any disease dependant on mobile humours (like catarrh, feber, asthma) was, according to him, hereditary, because

« *dépendant justement d'humeurs fluctuantes et dépourvues de caractères fixes elles n'ont pas le pouvoir de donner leur empreinte à la semence* (40) ».

Such fixity, Meara believes, is only possessed by those morbid influences that can actually insert their roots in the solid parts of the body. Adopting the proposals of a French medic, Joseph Du Chesne (1521 or 1546?-1609), Meara proposed a iatrochemical explanation, based on two salts, sulphur and mercury, whose presence at critical times in the tissues predisposes the individual possessing them to certain diseases. I quote :

« *Une maladie héréditaire est une maladie qui, lorsqu'elle a atteint un des parents et que sa racine s'est attachée d'une façon stable à l'une des parties solides quelconques de ce parent, descend, par une sorte de droit héréditaire, dans les héritiers* (41). »

(37) The encyclopedist (Diderot?) mentions de Meara, Zeller and Stahl.

(38) D. de Meara, *op. cit.* in n. 36. I will quote from the fragments translated into French by Bernard David in his medical thesis, *La Préhistoire de la génétique* (Paris : Broussais, 1971), chap. VI, 79-92.

(39) Ian Lonie discusses the « solidist » origin of hippocratical medical writers' first views of hereditary transmission of disease, who took from Democritus a general (pangenetic) theory based on the body tissues (solids) and adapted it to their humoral theory. « But even in Democritus, molecular structures from the tissues must have been conveyed in some way, presumably in a fluid [...] the tissue interpretation and the humoral interpretation are by no means mutually exclusive. » See his commentary on : On generation, in I. Lonie, *The Hippocratic Treatises* (Berlin : W. Gruyter, 1981), 116.

(40) From David, *op. cit.* in n. 38, 83.

(41) From *ibid.*, 79.

By the word « *parent* », Meara later clarified, he does not mean only the immediate couple that conceived the individual, but more distant ones too, many of them of remote generations; the root of the diseases can pass down through one or several generations without necessarily showing itself through the signs of the illness. Any constitutional disease that does not come in the semen (male or female), Meara wrote, must be considered accidental, although most of them have to act in utero, while there is still some fluidity, or indefinition in the individual's constitution. A typical accidental influence is exerted by the nutrients the body receives from the mother during gestation. These other influences are never however as strongly attached to the solid parts of the body as the roots of hereditary disease.

A theme that Meara treats with some depth is atavistic transmission. He accepts the Aristotelian stance that there are, *a priori,* grounds for doubting the proposition that diseases, or any other characteristic, can be transmitted from grandparents, or any previous generation, to the newly born without it having been possessed by at least one of the parents. First, it seems impossible that a causal agent could act without direct contact with the subject receiving the action. And second, to be able to transmit anything from a first party to a third one, the intermediary must at some point have it itself. If it is a disease, then one who is not afflicted by it, the Aristotelian argument would go, cannot transmit it.

Evidence shows, Meara retorts, that patterns of occurrence of disease point towards the existence of such aberrant (latent) causes, but only a vulgar empiricist would feel satisfied with the notion of « raw experience ». The medic, as the philosopher, should rather research the causes. The fact that both parents provide active elements in their *semen*, adds Meara (following Paré), allows for a balancing effect, when the influence of one healthy parent abolishes the defects of the unhealthy one, or diminishes it in such a way as to make it imperceptible. Impurity however is very rarely suppressed by the mixture of parental *semen*, and can still form part of the *semen* of the offspring, as this can be said to be an extract (or representation) of the man. Once transmitted to the following generation the impurity (a salt, for instance) can produce the disease even if the parent did not develop it. In all the participants, both ill and « healthy », the root of the disease is fixed. Such fixing of the root in the solid parts of the body is not however

synonymous with having the disease. The prohibition of Aristotelian philosophers is thus bypassed, he believes, because although all causes act by contact, it can be said that this contact need not be immediate, but can be mediated. A disease can be transmitted by the grandparent to a grandchild before it is born, in potency. There is something in the constitution of the intermediary parent that resists the expression of such potency, namely the healthy constitution of the other grandparent. There are situations, he adds, when the same cause can produce different effects in the children and in the grandchildren. The hereditary influence can either be resisted or not. Atavistic reappearance of a hereditary disease in a descendant, after having been absent in the family for one or several generations, ceases under this description to be a mystery.

Meara concludes his discussion on hereditary diseases by arguing that the curability of such diseases is related to the strength with which their roots are fixed to the solid parts of the body. They are in general more difficult to cure than non-hereditary ones. The strength of the hold is proportionate, he seems to be saying, to the level of impurity at the moment of the mixture of *semen* in fecundation. Good marriages (with healthy consorts) improve the situation by diluting the impurity, making the root easier to be taken out by chemical media. The latter, he affirms, must be specific solvents capable of washing the salt away. He also refers to an independent cycle possessed by hereditary diseases which makes them first increase, and then decrease their intensity within a family, as they are passed through the generations (42).

Meara's account of hereditary transmission was based on solid causation of a kind. He relied heavily on Paracelsian (iatrochemical) physiology (43), but his criticism of humoralist excesses, and his argument for a latency of hereditary causes brought closer the solidist dispositional account that characterized the most important medical authors of the late 18th century. The idea that it is not the disease itself but a disposition to it which is transmitted was a development of the use of Aristotelian potencies that pre-

(42) See de Meara, in David, *op. cit.* in n. 38, 89-92.

(43) Although some physicians were still refering to his account of the root of hereditary disease well into the 18th century. See for instance the description of transmission of scrofula given in R. James' *A Medicinal Dictionary* (London, 1743).

vious authors (Fernel for instance) had made. A dispositional cause can remain latent, and is best pictured as a defect (or a pernicious element) in the solid parts of the constitution, that makes the individual prone to react to triggering external factors.

The other significant clarification that Meara carefully stressed, and which proved important for the 18th century debate, was the limitation of the hereditary (or as he sometimes called it « the natural ») to whatever cause or influence is acquired by the offspring's constitution at the moment of its first conception, and is brought there by one (or both) parent's seminal juice. This left aside the question of whatever influences came to bear on the individual's constitution after it acquired its definite (solid) structure. Familial illnesses could thus be distinguished between those with a properly hereditary cause (which were stubborn and remained within a branch for generations), and those which the children also carried at birth, but were acquired through alternative routes, like the mother's blood (the foetus' nutrient) or even the mother's imagination (strong impressions, frights, etc.).

Meara, as I said, tried to develop a workable picture of solid to solid transmission of disease, or its cause, through the seminal fluid. He participated in the wave (44) of discontent with the previous century' speculative proliferation of hidden faculties and immaterial causes. Roger's book (1963) has shown how this reaction coincided with the growth of Cartesian mechanicism that had as a consequence the adoption of pre-existence as basically the most tenable view of the origin of organization and complexity in living organisms (45).

Pre-existence and the hereditary

By 1748, when young Louis took the hereditary transmission of disease to task, the pre-existence of the germ had been for some

(44) According to Louis, R. Lyonnet, in his *Brevis Dissertatione de morbis hæreditariis* (*op. cit.* in n. 36), clearly saw the problem, was very emphatic about his rejection of the hereditary character of most humoral diseases, and wanted to limit the hereditary cause to those communicated through the father's *semen* (he called them thus *morbum seminarum*), as the *semen* was the authentic origin of the solid parts. Lyonnet's further explanation that the seminal spirit can receive alterations from the solid parts and communicate them to the following generation was dismissed by Louis as a regression to the « *qualités occultes* » of an earlier age. Louis, *op. cit.* in n. 13, 55-71.

(45) See specially chapter III, « A la recherche des idées claires » of this excellent book.

time the mainstream view of generation. A considerable number of medics, however, remained faithful to the ancient Hippocratic and Galenic « dual seminal » view (46). Although, as I described above, Louis tried to make his general analysis applicable to both positions, the language and emphasis he makes give away his preference in favour of pre-existence. Both Maupertuis and Buffon had shown that the irregularities of the hereditary phenomena were one of the principal empirical obstacles in the way of pre-existence. Louis seems to have been clear about this. So did Albert Haller (1708-1777), who, when criticizing Buffon's double seminal view of generation and his use of hereditary resemblances as an empirical justification for it, produced a remarkably similar argument to Louis's (47). This was a courageous argument based on denying the reality of such phenomena (the resemblances between the physical constitutions of parents and children) and undermining the evidence in its favour.

Both Haller and Louis seem to have viewed, at this stage of their respective careers, the widespread belief in hereditary transmission of details of temperament, resemblance, and malformations as a pernicious prejudice that had to be checked. In the case of Louis, the ubiquity of variation was his evidence and the multi-

(46) As evidence for this see the dictionary entries quoted in C. López-Beltrán, Forging heredity : from metaphor to cause, a reification story, *Studies in the history and philosophy of science,* 25/2 (1994), 211-235. They are evidence of what Louis considered to be a sort of drowsiness and mental inertia among the majority of the medics (most of them provincial and backwards looking) which, it can be argued, his essay aimed to challenge and upset. What he saw as an irreflexive clinging to the Hippocratic-Galenic tradition in general, and to its views on hereditary communication of the idiosyncrasies of temperament (among them some diseases, or a disposition to them) was however seen by those physicians as uncontroversially true, as they received verification in their personal experience, in their practice, with different members of the same families, from several generations.

(47) Haller decided to counter Buffon's Maupertuisian use of resemblance to both parents as an empirical fact which preformation could not explain (and which needs a dual seminal, successionist explanation), he « prefer[red] to deny to Mr. Buffon that offspring resemble their parents. If I prove this point, the offspring are no longer images of their parents, and the remainder of the edifice will collapse upon itself. We leave aside that for any case in which resemblance to a parent can be adduced there always are a greater number of cases in which the offspring has acquired neither the traits nor the likeness of any of them. My thoughts go still further. There is no man who is similar to another in the internal structure of his body, and in consequence no child is similar to its parents » — adapted from Sloan's translation, J. Lyon and P. R. Sloan (eds.), *From natural history to the history of nature* (Notre-Dame Univ. Press, 1981). This last theme, of internal resemblance, was later to acquire a high profile in the discussions around the hereditary, as more observations were gathered.

farious influence of secondary, external causes his theoretical resource. According to his view, the original germ, pre-existent or not, was acted upon by innumerable non-natural (external) agents that could produce in it different sets of secondary, accidental qualities (48). Only the more essential qualities and organization were given by the internal (germinal) route. No deviation or peculiarity that distinguished any family or group could pass through such route, and so they could not be called, in any proper sense, hereditary.

Louis made use of Boerhaave's well-established physiology of fibres (as the solid elements of the body) and humours to bring home his point about the secondary role of the latter :

« ... *l'action des fibres plus ou moins forte & vigoureuse façonne & modifie différemment les humeurs de notre corps; ces humeurs agissent suivant leur quantité sur les solides dans lesquels elles sont contenues, & elles en determinent diversement les actions : de-là viennent les complexions particulieres qui mettent tant de différence entre les hommes, tant par rapport aux dispositions du corp qu'aux caracteres de l'esprit* (49). »

So, in Louis' mind, morbific humours of any kind could only have superficial, erradicable influences. The obvious weakness of his position was — as his critics insisted — his stubborn dismissal, as mere coincidences or fairy tales, of all the striking cases of hereditary transmission of disease or malformation that had impressed most other medical men.

But pre-existence allowed at least another approach to the hereditary that was, paradoxically, based on humoral causes. The judges of the 1748 Dijon contest were not apparently disinclined towards such a view, as they gave a special mention to G. Rey, a provin-

(48) « ... *les variations,* writes Louis, *[ne] décident donc rien en faveur de la question des maladies héréditaires, puis qu'elles ne vienent point d'un principe interne et de dispositions inhérentes et immuables; mais qu'elles dépendent uniquement des chose non-naturelles qui sont toutes extérieures [...] Les hommes sont soumis a cette regle generale comme les plantes et les animaux leur caractère & leur tempérament dependent d'une [infinité] de choses extérieures qui peuvent être variées a l'infini : c'est une verité reconnue en médecine.* » (*Op. cit.* in n. 13, 74-75.)

(49) *Ibid.*, 36-37. Towards the end of the 17th century, Boerhaave, who was one of the most influential physicians and physiologists of the first half of the 18th century, developed an alternative solidist description of the body and, among many other things, wrote about the hereditary transmission of constitutional particularities within his physiology of fibres. See G. A. Lindeboom, Boerhaave's concept of the basic structure of the body, *Clio medica,* 5 (1970), 203-208.

cial medical man (50), for detailing it. His basic argument was that the germ is in a state of *emboîtement* (in the mother) previous to its contact with the humours in the semen during fecundation, after which, Rey writes, there is a « *développement des fluides et des solides* ». It is this development undergone by the undifferentiated (though organized) germ that, according to Rey, made possible hereditary transmission of resemblance in general, and of disease in particular.

The two suppositions that Rey puts forward as reasonable candidates for proof are : 1° that the germ interacts at fecundation with seminal fluid from both paternal and maternal sources, and 2° that « *les deux fluides masculins & féminins, qui en decoulent, sont impregnés de toutes les humeurs particulieres du pere & de la mere* (51) ». Both hereditary resemblance and disease, Rey argues, are a consequence of the transformations that these humours induce in the solid parts while they develop. Only a liquid (fluid) cause, Rey adds, can account for the mixing of characters (of both parents) in hereditary transmission, and previous authors have been wrong in trying to deny this. Liquids can permeate through all the bodily parts and act upon the developing embryo in a pretty discriminate way because they can find their proper place of action through « affinities ». There are « general » humours (lymph) which affect general parts, and particular humours which act upon specific organs.

Rey also argued that strange, or not completely compatible, liquids can act upon and distort a developing part because there can be partial affinities to them. Both the existence of « *mulatres* » and of hereditary diseases can be explained, he claims, by this incomplete or distorted action of certain fluids (52). Either because these hold the seed of a disease, or because of the influence of a different variety or species, these fluids could thus act upon

(50) From Chaumont, close to Lyon. G. Rey was the only author among the winners of the contest to respond to Louis' challenge by publishing, immediately after him, his dissertation, *Sur la transmission des maladies héréditaires, qui a balancé le prix de l'académie de Dijon en 1748* (Paris, 1749).

(51) Rey, *op. cit.* in n. 50, 10.

(52) « ... *il paroit,* Rey writes, *que les corps parfaitement homogénes sont parfaitement miscibles entr'eux, & que les autres refusent plus ou moins de s'unir & de se marier ensemble, suivant le degré plus ou moins grand de leur hétérogeneité, ou plutôt de leur improportion.* » (*Ibid.*, 16.)

and distort either the general constitution, or a specific organ or part, depending upon the kind of humour, general or specific. « *Métissage* » and the transmission of certain constitutional diseases (like scrofula or scorbut) are both due to the action of the « general lymph », whereas other, localized affections are given by tainted particular one.

Two further crucial factual characteristics of the hereditary phenomena were dealt with by Rey in his humoral theory. One was the « irregularity » of transmission, and impredictability of outcome of crossings, which (like the ancients) he explained by the fluidity and incompleteness of the mixtures, and the different powers exerted by the lymphs of the mixture *i. e.* male, female and the germ's own lymph. The other characteristic he explained was atavistic transmission. Claiming that the only way to make sense of the « jump » of characteristics from several generations back (avoiding the unphilosophical appeal to indirect causation or to latent causes) was by hypothesizing the existence of the germ inside the ancestors' body. Thus atavism is evidence for *emboîtement*. Fluidity also explains the way that this communication, for instance from grandparent to grandchild, is effected. The idea is that humoral « vice » can diffuse itself from the grandparent's body into the nested grandchild's germ, acting upon it without necessarily acting upon the first, immediate child (the parent), whose tissues can, in some cases, be passed as a filter without receiving the damaging seed (53). The closer the nested germ is to be born (*i. e.* the less germ boundaries the morbid humour has to filter through) the higher is the chance of infection. By « solving » at one stroke the problem of the origin of the solid parts of the body, the defenders of preexistence left open the door for a humoralist revival. The hereditary influence of the seminal fluid can still be accepted in terms of an ovistic theory, with the further advantage of avoiding at the same time the problem of the female *semen* that plagued the double seminal accounts (54).

(53) Rey recognized that under ovism this only gives a straightforward explanation of maternal line atavism, but did not extend himself further in this direction.

(54) This logical possibility was seen by nobody as clearly as by Charles Bonnet, whose highly sophisticated view of generation depended on his attempt to explain the hereditary transformations that the male's *semen* induces on the pre-existent germ in the case of mules. He felt sure that all resemblances could be accounted for once this, the most striking of cases, was understood. Concerning hereditary diseases, Bonnet felt even more confident of explaining them, as he wrote : « *Les maladies héréditaires souffrent moins de difficultés. On conçoit facilment que des sucs viciés doivent altérer la constitution de germe. Et si les mêmes parties qui sont affectés dans le pere ou dans la mere, cela vient de la conformité de ces parties qui les rend susceptibles des mêmes alterations.* » (C. Bonnet,

Both Louis and Rey wrote in an age when ancient humoral physiology was in decline, while arguments for pre-existence and against successive, epigenetic views of generation were quite powerful. Despite the fact that humoral physiology and the Hippocratic-Galenic double seminal view of generation had, so to speak, the facts of hereditary recurrences on their side. Both irregularity of and resemblance to both parents and to ancestors, etc., fell with a certain ease under their explanatory wing, while the rival theories had to be stretched, or else their supporters felt the need to simply ignore as irrelevant those same facts. The problem was that all appeal to proliferating humours, though still popular among many medics, was seen as completely regressive by those trying to leave behind the retarding weight of the ancients. Particularly questionable was the idea of humours which could have discriminative powers in order to act selectively and subtly, thus giving all the nuanced effects that were found in the hereditary (55). « Solidism », with its more down to earth view of causation and individuality, was seen by most as the best alternative, and one that was favoured by the rising profession of the surgeons.

If constitution (or temperament) was to be basically understood as dependent on the solid parts (as a whole or as a set of separate organs), then disposition to disease was to be dependent on the organization or structure of the whole bodily frame, or of particular tissues or organs. So much was clear, but the problem remained of how to account physiologically for their « hereditary » transmission, the reality of which very few medics were really willing to deny.

At the same time, the debates around generation — after Haller's and Bonnet's strong attacks on the mid-18th century wave of « successionists » and « epigenists » like Maupertuis, Buffon and Needham (56) — seem to have entered into a sort of impasse or

Considérations sur les corps organisés, t. 3, of his *Œuvres d'histoire naturelle et de philosophie* (Neuchatel, 1779), 32.) See also chapters III and V of part 1, and chapter VII of part 2.

(55) « *On sait aussi,* wrote Pujol concerning this point, *qu'il est bien des Médécins modernes du plus grand nom, qui rejettent de la Médecine tout ce qu'on nomme causes humorales des maladies, comme êtres phantastiques et absolument imaginaires; pretendant que tous nos maux sans exception on pour cause nécessaire quelque vice des solides, ou ce qui revient au même, quelque vice organique.* » (*Op. cit.* in n. 4, 228.)

(56) There is as I said above some confusion around how to denominate the position of those who opposed pre-existence. Peter Bowler, following Jacques Roger, has suggested that positions like the ones held by Maupertuis and Buffon should not be called epigenetist

stalemate. Most authors of the next generation could not see how to decide between the very coherent and complex arguments developed by the opposing factions according to the available evidence (57). Some medics felt very uneasy about their appeals to hereditary transmission of constitution (or temperament), because as a very basic supposition in most of their approaches to individuals with idiosyncrasies both of disease and of reaction to treatment, it did not have a solid enough physical or physiological base. Beside that, the rhetorics of case collecting and storytelling (very common in the medical tradition, and used to establish and disseminate the belief in hereditary disease) were increasingly coming under attack by statistically-oriented, materialistic and mechanically-minded authors of the late 18th century (58).

As Louis wrote : the category of hereditary disease was very common in informal parlance among medics but was not, in the 18th century, normally considered in the classifications of disease (59). Either because the origin of the disposition (or diathesis) was not considered crucial for its cure, or else (at the other extreme) because hereditary diseases or the dispositions were considered incurable. The fact is that by the 1780's the phrase itself « hereditary disease », so pervasive among medics, was becoming increasingly difficult to use in as self-explanatorily a manner as

(though they were called so at the time) because they did not advocate a progressive development and appearance of the parts, but a sudden organization of a new organism from the mixture of semens. Louis' division between pre-existence and succession perhaps helps, in leaving epigenesis free to describe developmental views, such as Wolff's. The problem with all this, to my mind, is that we risk anchronistically imposing upon 18th-century authors our own views of what a developmental theory is. See P. Bowler, Preformation and Pre-existence in the 17th-century, *Journal for the history of biology,* 6 (Fall, 1971), 221-244.

(57) See for this Elizabeth Gasking, *Investigations into generation, 1651-1828* (London : Hutchinson, 1967).

(58) What makes unique the discussions that physicians had in late 18th-century France around the subject of hereditary disease, is that they reversed the terms, so to speak, on which the debates on generation had formerly been conducted. The justification of their belief in hereditary transmission of dispositions and idiosyncrasies was their aim, and the discussions over generation were a mere background, to which they conformed but did not feel they had to slavishly follow. They concentrated their efforts in producing viable transmission hypothesis with their physiological theories and the growing restrictions that anatomy, chemistry and the accumulation of observations were setting them.

(59) Neither Philippe Pinel nor William Cullen, the French and British classifiers of disease, included hereditary as an important nosological category, although they both strongly relied on the concept at some point in explaining madness (Pinel) and gout (Cullen). This of course can also be due to the equivalence (for them) of the concepts constitutional and hereditary, or else their belief that constitutional diseases tend to be hereditary.

before. The hidden humoralists associations it conveyed and the absence of a proper (solidistic or other) account of transmission increasingly worried the most theoretically minded physicians. In France, Louis' challenge had basically remained unconfronted. In Britain, similar sceptical arguments had begun to appear (60). It was in this context that a second essay competition was organized amongst French physicians, with the subject matter of hereditary disease. The organizing body was this time the Parisian Société royale de médecine, in the years between 1787 and 1790, which as is well known was by then unknowingly living its last days.

A PROBLEMATIC QUESTION. *MALADIES HÉRÉDITAIRES* AND THE ROYAL SOCIETY OF MEDICINE (1788-1790)

I have tried to show above how Antoine Louis' short 1748 essay on « *maladies héréditaires* », no doubt assisted by its author's later prestige and power, gave the subject a unique status in pre-Revolutionary France. Besides the purely conceptual reasons (which as we saw were not few) many medical men felt the need to meet the challenge of his, and other sceptics', arguments. Perceived as coming from the controversial permanent secretary of the Académie royale de chirurgie, the arguments must have acquired a particular poignancy, especially within the Académie's rival, the Société royale de médecine. Eventually, this institution would promote the search for a solution to Louis' challenges in two successive competitions (1788 and 1790) (61).

As was pointed out above, the tone in which the questions were set made it clear that the Society expected the competitors to face Louis' challenge head-on, and did not want them to fall back on the old, received, presuppositions and unspoken assump-

(60) The British physician William Cadogan (1711-1797) published in 1771 a forceful criticism of hereditary explanation of gout and other constitutional diseases.

(61) Who was directly responsible for the choice of subject I have not been able to discover, but it seems to me likely that Vicq d'Azyr, the brilliant and theoretically minded permanent secretary of the Society, had some influence on the decision, as he later published in the *Dictionnaire de médecine* of the *Encyclopédie méthodique* (Paris, 1787-1830) one of the most analytical and clarifying essays (submitted by Pagès). Another senior member (Thouret) could have had some influence. He was the most influential among the adjudicators of the prize.

tions about the phenomena of hereditary transmission of disease, and on the same old slack, unverifiable explanations that usually accompanied them, whether humoral or otherwise.

The questions set for answer by the Society in the public session of February 27, 1787, with a prize of « *600 livres* » were : « *Déterminer 1° s'il existe des maladies vraiment héréditaires, et quelles elles sont : 2° s'il est au pouvoir de la médecine d'en empêcher le développement, ou de les guérir après qu'elles se sont déclarées* (62). »

According to the judges' annotations, there were 13 dissertations entered for the first contest. Twelve of them survive in the archives of the Académie de médecine (Paris). The length and quality of them vary very much, but there are several worth looking at, as they were both carefully researched and forcefully argued.

After what seems to have been difficult negotiations (the evaluations of the judges that remain on paper (63) show that they favoured different candidates for the prize and that they were applying widely different criteria) the jury decided not to award the prize, but to re-open the contest with the same questions but raising the prize money to 800 *livres*. Although the jury declared itself not satisfied with the results, three dissertations were singled out as being of value. One, written in Latin in an elegant aphoristic style by the Viennese doctor Michel-Raphaël de Gellei, was given a « *prix d'encouragement* » of 100 *livres*, as the only one which had understood « *le sens du programme* », although in many instances his responses seemed inadequate or incomplete. Of the other two dissertations mentioned in the report of the Society as having some « well presented details » one is missing from the archives, and the other one is the first version of Alexis Pujol's essay on the subject (64).

(62) See *Histoire et mémoires de la Société royale de médecine*, vol. IX (Paris, 1787-1788), 17.

(63) Minutes d'examen de mémoires sur les maladies héréditaires, 181-23-1, 5, Archives de l'ancienne Société royale de médecine (SRM) in library of the National Academy of medicine, Paris. All documents described with similar codes (SRM, 154-9-4) refer to the same archive. See appendix 1 in López-Beltrán, *op. cit.* in n. 35, for a complete list and commentaries on these essays.

(64) The report only gives the epigraphs under which they were submitted. The missing dissertation had one from Voltaire with a sceptical air : « *Il ne suffit pas qu'un système soit possible pour mériter d'etre cru.* » Pujol chose a classical Hippocratical dictum : « *Semen ab omnibus partibus prodit, à sanis sanum, à morbis morbosum.* » See *Histoire de la* SRM, *op. cit.* in n. 62, 18. Pujol's first dissertation is number 200.2.9 of the archives of the old Royal Society of medicine.

In the summing up, the report detailed further the discontent with the work entered for competition :

« *La plupart des concurrens ont supposé plutôt qu'ils n'ont prouvé l'existence de maladies héréditaires; ils n'en ont pas assez exactement déterminé la nature. Il s'agit de savoir si quelques vices morbifiques se transmettent réellement & individuellement des pères aux enfans, ou si les maladies qu'on appelle héréditaires, ne sont pas plutôt une suite de la conformation des organes, qui, dans les pères et dans les enfans, doivent être, à raison de leur structure, sujets aux mêmes affections. C'est sur l'existence & la nature de ces maladies qu'il faut sur-tout porter ses recherches* (65). »

The Society was here rephrasing Antoine Louis' old question. If, on the one hand, diseases that « seem » hereditary are really only due to a common defect of conformation of the solid parts, there is no clear way in which the individual conformation of the parents body can have a direct causal effect on the conformation of the embryo. If, on the other hand, hereditary transmission of disease through humoral vices cannot be said to have any particular route or character that would justify the separation of it into a different category then there is no real sense in using the old analogy of inheritance.

The first set of commissioners thought that the essays lacked a certain amount of scepticism, and that they also lacked any clear picture of how transmission can really (not speculatively) be accounted for. They wanted the contenders to fight Louis on his own terms. Impression that is certainly reinforced by the fact that de Gellei's essay was praised in one of the judges' personal notes (Thouret's; who was, by the look of it, the dominant judge) for beginning by throwing doubts on the existence of hereditary disease and then proving their existence by refuting these doubts. On the other hand, the same judge criticized several of the dissertations (including the missing one coded as F) for admitting too readily the fact of their existence. At the same time he praises in « F » the style and manner of the rest of its argument (66). Several of the contenders of the second round (some of them having rewritten their first version) began their arguments by showing a certain surprise, and some outrage, at the Society's demand for further

(65) *Histoire de la* SRM, *op. cit.* in n. 62, 18.
(66) See *Minutes d'examen..., op. cit.* in n. 63, especially 181-23-1.

proof of the existence of hereditary transmission of disease. They claimed that the overwhelming number of indubitable cases gathered in the literature — and seen in everyday practice — was enough to convince any reasonable person (which was exactly what some of the judges *did not* want to hear). They complained of undue bias. One of them later wrote a personal account of how he saw the procedure of this contest and went as far as accusing the judges of having reversed a former decision that favoured him, for ideological (anti-religious) reasons (67). The fact is that many of them were surprised that good, scholarly well-informed and well-argued dissertations did not manage to convince the judges. Amoreux (whose first dissertation had been the favourite candidate for the prize of at least one judge) wrote that he did not see how anybody could satisfy the Society with more; had he not quoted almost every important author, ancient and modern, on the subject, and mentioned a fair number of reliable cases? Had he not argued fairly and clearly about causation with the prevailing physiological knowledge; what more could anyone do? He then proceeded to re-write his piece adding details to every one of its parts, especially to the (already outstanding) bibliographical research.

Apart from the justifiable claim that most authors had been somehow begging the question in their 1788 entries, it can fairly be said that the many considerable analytic virtues of some of the essays submitted to contest were ignored in the first set of judges' reading. Several authors displayed a striking clarity about the distinction between congenital and connate causes (later praised by the second group of commissioned judges), emphasized the need for clearcut observational criteria to distinguish the hereditary from other influences (like homochrony, specificity, curability, etc.) and commented upon the inevitable relationship between « normal » and pathological heredity that solidism (but not humoralism) presupposed. Perhaps a reason why the first set of judges were not impressed is that these ideas were more common amongst French 18th-century medical men that appears at first sight. The judges' reluctance did however provoke a sharpening of the arguments presented for the re-run of the competition.

In 1790 a new set of judges, and a new and more carefully

(67) See A. Pujol's « Notices et éclaircissemens préliminaires sur cet ouvrage », in *op. cit.* in n. 4, 211-236.

argued set of pieces produced a different result. At least four dissertations of very high quality, although not agreeing in all aspects, made a strong and authoritative case for why a physician of the late 18th-century could and should defend the principle of hereditary transmission of disease (or better still, of the disposition to it), regardless of what some theoreticians could sceptically say or write. These were the dissertations written by Amoreux, Pujol, Pagès and Rougemont (68).

Although again not completely satisfied, the Royal Society commissioners decided to grant the prize to Joseph-Claude Rougemont's (1756-1818) contribution (69). Under a « eugenic » epigraph from Fernel *(« Maxima ortûs nostri vis, nec parum felices benè nati »)*, Rougemont, according to these new judges, treated the question in all its multifarious aspects, and made an « *exacte & sévère analyse de tous les écrits & de tous les faits qui ont quelque relation avec le problême proposé* ». He carefully distinguished hereditary diseases from those contracted by the child within the mother's womb or during birth. Some shortcomings in method, they added, were balanced by the clarity he brought to the whole subject. An « *accessit* » prize was given to Pierre-Joseph Amoreux, whose great historical erudition was highlighted (the essay by Girard (SRM, 119-33-A) was also very good on this aspect), but who failed in the « *prophilactique & curatif* » aspect. Both Alexis Pujol (1739-1804) from Castres and Jean-François Pagès from Alais (*i. e.*

(68) Other dissertations could be added to this list. For instance those of Ladevere (SRM, 119-30-5) and Girard (SRM, 119-33-A) were excellent in some aspects but were less well-rounded. Both Pujol's and Pagès' works were published around the turn of the century, as we have seen above.

(69) Unfortunately the manuscript of Rougemont's prize winning essay is missing from the archive, so I could not profit from it for the present work. For some reason Rougemont's text was not published in France. As he was professor of anatomy and surgery at Bonn University at the time, his work on hereditary disease was very soon published in Frankfurt in a German translation, and according to J. H. Steinau, it became a classic on the subject in early 19th-century Germany. Joseph-Claude Rougemont, *Abhandlung über die erblichen krankheiten*, transl. : Friedrich Gerhard Wegeler (Frankfurt, 1794), in-8°. Mentioned in Julius Henry Steinau, *Pathological & Philosophical Essay on hereditary diseases* (London : Marshall & Co., 1843). For bio-bibliographical details on Rougemont see Dezeimeris & Ollivier & Raige-Delorme, *Dictionnaire historique de la médecine ancienne et moderne*, 4 vols. (Paris : Bechet Jeune, 1828-1839), vol. 4, 24-25. In the same work information can also be found on Alexis Pujol (vol. 3, 764-765), and Pierre-Joseph Amoreux (vol. 1, 111).

Alès) received honorary mentions. Among their many merits, the Society again chose to praise their clear distinction between congenital and connate diseases (70).

Responses to the sceptics

As I have said the commissioners were not yet totally satisfied with the second, improved, round of essays. But they awarded the prize all the same, because it already had been remitted once. However the commissioners stated that the question was not yet solved. Still wanting were « *nouveaux éclaircissemens* », to which medical men should apply themselves zealously.

« *Dans ce genre,* they added, *les observations isolées considerées séparément, ne peuvent avoir qu'un degré d'utilité très-borné. Ce ne sera qu'en les réunissant & en les comparant, qu'on pourra leur donner de la valeur* (71). »

This invitation to surpass the narrative, case quoting method that had plagued the subject for too long, and to gather the evidence in a more cumulative fashion, was a clear recognition that

(70) This distinction was made by many authors in slightly different ways. The meaning of this vocabulary is sometimes confusing, and as Pujol pointed out (see *op. cit.* in n. 4, 231) even the Society's *commissaires* seem not to have had the distinction clear. Traditionally, as we have seen above, the connate diseases are those acquired after fecundation by contact in the mother's womb with her humours (through her blood). Some authors include among these diseases and defects acquired by mechanical influences during pregnancy (blows, etc.), and others believe that the mother's spirit, imagination or states of mind can also exert some kind of influence and produce connate peculiarities. Under old style humoralism many authors did not see any reason why not to include the influence exerted in the newly born child's constitution by the mother or the nurse's milk. Congenital diseases on the other hand are those believed to have been transmitted to the offspring at the moment of its first formation, *via* the parent's seminal contributions (fluid or solid). Under a solidistic perspective this was the only kind of truly hereditary transmission. Humoralists were more divided on this matter, some wanting also to restrict the hereditary to influences at the first formation, while others saw no reason for this restriction, considering any humoral cause communicated by any of the parents before the constitution of the infant becomes completely fixed (*i. e.* before the end of the first year) as worthy of the hereditary title. Although old, then, the distinction between congenital and connate was difficult to determine, the best participants in the 1790 contest can be said to have brought to it a renewed clarity.

(71) *Histoire et mémoires de la* SRM, vol. IX (Paris, 1787-1788), x-xi.

the consensus amongst wider sectors of the medical community was changing away from their old, case-based and bookish inductive strategy, towards a more « statistical » approach. In several competition essays, authors had acknowledged that Louis had a point when he questioned the use of tales and anecdotes to justify belief in the hereditary transmission of physical attributes, and was right when he wrote that « *les principes qui forment la vraie Théorie de la médecine ne s'aquierent que par des recherches penibles, et des travaux longs et difficiles* » (72).

However, Louis' methodological point was not the focus of so much attention in most of his rival's works (as it was to become for hereditarians of the following century). Other aspects of his challenge came to the forefront. Four of the issues raised by him were recurrently and vehemently taken up by the more acute participants; I will briefly describe how these issues were tackled by the more lucid competitors (73).

1 / *The challenge to the « parent-offspring resemblance of constitution (or temperament) theory »*

This was Louis' most dramatic challenge to 18th-century medical common sense. Hereditary communication of at least some of the components of an individual's temperament (or constitution) went unquestioned by the whole medical tradition. According to humoralism all resemblances (moral, physical, pathological) within a family or other genealogical group could be attributed to similarities in the proportions of the different humours. With the rise of mechanistic solidism after the 17th-century, family (and group) resemblance became linked with the explanation of the origin of

(72) Louis, *op. cit.* in n. 13, 4. In this point, Amoreux, Ladavere, Pujol, among others, did try to justify their inductive procedures, and as I said felt somehow betrayed by the Royal Society's siding with Louis in this issue. They believed that carefully selected cases, accompanied by sound physiological and pathological knowledge, did provide a good base for making general statements about hereditary transmission. The adequate selection of old authorities, and specially the experience that many years of practice with sometimes different members of the same family gave to the best observers amongst medical men, clearly provided them with a sound basis for belief. On the other hand, sheer accumulation of cases never would compensate for the combination of a well trained eye with a well-read mind that good, old style physicians had.

(73) A brief description of the structure of each essay submitted for the 1788 and 1790 competitions can be found in appendix 1 of López-Beltrán, *op. cit.* in n. 35.

solid parts, and their posterior maleability under the action of humours. Alternative generation theories have different bearing on this issue. Pre-existence, as in Louis' and Haller's cases, could provide a base for the radical questioning of the reality of any causal link between parents' and offspring's organizations, *i. e.* of their resemblances. Constitution (solid organization) is something that comes with the pre-existent germ, and any predisposition to disease (or diathesis) is either already there, or is acquired, but not inherited; unless you widen your criteria and include humoral causes into the hereditary, in which case the problem exists of separating those causes from other, external humoral influences. As shown above, this is the position adopted by Rey in 1748, and also — with variants — by many of the 1788 and 1790 competitors that were not prepared to abandon humoral hereditary influences (74). The pre-existentialists among them (especially Besuchet [SRM, 200-d-2, 3]) used Bonnet's ideas about the influence of seminal humours in the transformation of the germ during its development, which as I said were similar to Rey's.

The strongest solidist in the 1790 competition was Pagès. Where others (Pujol, Amoreux, etc.) were prepared to accept that certain hereditary diseases had as their main cause a morbific humour *(« levain », « virus »)*, Pagès was inflexible in his refusal to grant the point. His solidism he related also to disputes over generation. Although he denied that generation theories should have a primal position in the discussion about hereditary disease (75), he argued that dual seminal views (like Hippocrates' and Buffon's) made it easier to account for hereditary transmission of constitutional traits, both from father and mother, and from ancestors; and would also help draw a line between real hereditary influences (internal : incorporated into solids at first formation) and secondary (humoral,

(74) A reason being that some of the traditionally hereditary diseases seemed to be of a humoral nature (like scrofula). On the other hand (and under the assumption that, lodged in different organs, one morbid humour would produce different diseases) the « heritability » of humoral causes provided an economy of causes, given that the persistence in one family of only one kind of morbid humour could account for different affections in different individuals and generations. Very many 18th-century medics seem to have believed this.

(75) « *Je croi,* he wrote, *que la nature des maladies héréditaires, loin de recevoir quelque lumière de la part des hypothèses de la génération, doit au contraire leur fournir des preuves, & que si on parvenoit à la connoître clairement, cela répandroit beaucoup de jour sur le mystère de la génération.* » (Pagès, *op. cit.* in n. 76, 162.)

external) ones. In his view, only a small set of specifically-transmitted constitutional predispositions to certain diseases (through generation, in semens) deserve the adjective hereditary (76). The obscurantist and abusive practice of many previous, and contemporary, physicians in applying the adjective to any — and every — disease could be checked, Pagès believed, by means of precise external criteria, derived from a clear definition. The principal criterion had to be the time of appearance of the disease.

« *Un caractère essentiel,* he wrote, *des dispositions héréditaires c'est d'observer pour leur développement, dans les enfans, la même époque, le même age que chez les parens* (77). »

« Homochrony », as this came to be known after Haeckel, was also stressed as a crucial element of « the hereditary » by other competitors. Pujol and Amoreux used it to separate humoral hereditary influences from non-hereditary ones. The transmission of the influence would occur through the *semen* (or mother's blood) and it would then either act upon the constitution during the first formation or remain in the body without effect until a later, determined stage, when it would produce its noxious symptoms. As Amoreux wrote, hereditary diseases are usually not carried by the children at birth but are « developed » at a certain age because

« *transmissible au moment de la formation, par un hétérogene mélé a la semence prolifique, le principe morbifique s'ente pour ainsi dire, sur le germe seminal au moment de la formation, et ce principe plus ou moins fortement, se modifie et s'altere pendant l'acroissement du foetus, de l'enfant et de l'adulte, et donne lieu ou à un mauvais tempérament ou à une maladie, ou enfin à une simple disposition* (78) ».

The other basis of Louis' scepticism concerning resemblance of general constitution was the uncontrollable proliferation of causes

(76) They are « epilepsie, hemoptysie, pthysie, manie, melancholie, hysteria, hypochondria, & apoplexie. » I believe that Pagès' stern criteria, and strong solidism appealed to Vicq d'Azyr more than the other authors' « eclectic » positions, and that is why, although not given the prize by the Royal Society, it was this essay that he included in the *Dictionnaire de médecine* of the *Encyclopédie méthodique* (*op. cit.* in n. 61).

(77) Pagès, *op. cit.* in n. 76, 160. This author explains homochrony based on a peculiar physiological theory. He sustains that each organ of the body has a certain period, in the individual's life, at which it exerts its main influence. It is when it is « switched on » when the period arrives that the organ weaknesses and latent predispositions are revealed, in the form of ailments or disease. See p. 163.

(78) Amoreux, dissertation of 1790 (SRM, 120-3-1), 17-18.

(external and internal) acting at the moment of the first formation. To counter this argument, Amoreux first accepts that variation among children of the same family is a striking reality, and that it is due to various influences at the time of conception. However, he adds, the weight each kind of cause has in shaping the individual's temperament is not equal. Primary, humoral and solid, hereditary causes far outweight the secondary, environmental ones. It seems undeniable to him, as to many others, that peculiarities of temperament and constitution run in families. As Pujol wrote :

« ... s'il est vrai que la couleur de la peau soit héréditaire parmi les hommes, comment les tempéramens ne le seraient-ils pas, eux dont cette couleur est ordinairement le signe et même l'effet? [...] on ne conçoit comment cet habile homme [Louis] a pu se determiner à nier un fait si notoire et si général.

[...] la propagation des tempéramens, par voie de succesion et d'héritage est un de ces faits généraux dont il est aisé de constater la realité, dès qu'on veut examiner curieusement et en détail les differentes familles dans la réunion [que] composent les grandes cités (79). »

This curiosity however was not to be limited to the superficial qualities of colour, height, weight, and form of the body, but to be extended to the internal constitution of tissues and organs. Surgery provided, in the late 18th century, a new observational window that few of the contenders failed to mention. Resemblance within families could be traced to the minor details of inner configuration, revealing a multitude of other facts that increased both the number and the evidential strength of hereditary claims. This was specially the case when peculiar hidden defects began to turn up in autopsies. As Amoreux wrote :

« Les anatomistes se sont quelquefois apperçus d'une conformité de structure ou d'organisation defectueuse en explorant les cadavres de plusieurs sujets de quelques familles; et les exemples seroient sans doute plus frequents si on suivoit avec plus d'attention ces sortes de recherches (80). »

(79) Pujol, *op. cit.* in n. 4, 248.
(80) Amoreux, *op. cit.* in n. 78, 15.

Normal resemblance within families had since Hippocrates been used, in an analogical argument (81), to justify the belief in *pathological* resemblance. The rise of solidism — and surgery — tightened this analogical move amongst physicians. The emphasis on personal observation (and accordingly less reliance on ancient reports) and the attention to structural detail, reinforced the medical men's confidence in the reality of hereditary transmission of individual (idiosyncratic) constitutional characters in general, and of the predispositions to diseases that these could entail. However the first *rudiment* or embryo came to be formed, they were convinced, there had to be a causal mechanism responsible for the impression on it of elements of both its parents' particular constitutional characters. For the want of a better model (which generation theories did not provide) Pujol described this by a metaphor :

« ... *la même main qui calque si scrupuleusement la physionomie du fils sur celles du père et de la mère, doit passer aux ressemblances intérieures, et rendre avec la même exactitude, organe pour organe, viscère pour viscère* (82) ».

This hand, this mechanism whose basic « external » manifestations late 18th-century medical men were trying to define, was to become some years later, l'« *Hérédité* », Heredity, with a capital H (83). The idea of such a general (unified) mechanism for hereditary transmission of both « normal » and « pathological » features was facilitated then by the strengthening of solidism. Humoral morbific causes would always maintain the connotations of a poison : alien, external, disruptive influences (somehow more easily eradicated). On the other hand, the solid-solid communication (through a « normal » mechanism) of conformational flaws provided a perfect frame for the analogical reasoning described above. It was a frame that somehow could encompass naturally all the biological phenomena that came under the aegis of the adjective « hereditary », normal or deviant : from family resemblance to

(81) The importance of this analogical argument cannot be exaggerated for the history of hereditarianism. As Canguilhem has shown, the move from normality to pathology was not a natural one until well into the 19th century, so it was I believe an anomaly of the hereditary. Blumenbach for instance reacted strongly against this kind of arguments before adopting them himself, and later popularized them.

(82) Pujol, *op. cit.* in n. 4, 24.

(83) See López-Beltrán, *op. cit.* in n. 46.

hybridization; from transmission of physical deformity to hereditary disease. This strengthening of the analogical domain, by unifying it under one kind of causal mechanism of transmission (and not a diversity) opened the door to a further development : from visible to invisible resemblances (84).

2 / *The challenge to the causal-physiological resource to humoral causes, and their confused and maleable non-specificity, or proteism*

Humoral causes for hereditary diseases were defended by several of the contenders. Pujol, for one, was specially annoyed that the Royal Society preferred to stand by Louis' speculative denials. He decided to write for the second (1790) contest a whole new chapter trying to prove this. He started by arguing that

« *la transmission des vices humoraux et virulens par voie d'héritage ne sera jamais prouvée complétement par des raisons speculatives* (85) ».

Due to the close interdependence between humours and solids, he claimed, it is never easy to pin-point the original bearer of a morbific cause. Ill humours act upon solid parts as much as diseased solid parts alter the fluid parts' normal composition (86). To restrict the hereditary principle to solid-solid transmission is to blind oneself to empirical evidence, both physiological and pathological. Different taints or humours can act upon solid structures at different times. To call some of them hereditary, it is enough to show that they have acted on the conformation of the germ *before* or *at* the moment of its fecundation, or that they were incorporated into the bodily fluids in that period, as part of the semen. Many observations point in such a direction, he continued. The fact that some of these « *levains* » can also be communicated by non-hereditary means is no reason to deny this. Amoreux adds that strict solidism is untenable because many real hereditary diseases cannot be unambiguously classified as either humoral or solid.

(84) Which was to prove crucial for the leap from physical inheritance to moral inheritance.

(85) Pujol, *op. cit.* in n. 4, 228.

(86) Amoreux wrote : « *Un virus transmisse (sic) [ou] une organisation vicieuse derangeront bientot l'harmonie qui doit regner entre les parties solides et les fluides; de [là] des maladies organiques et des maladies humorales.* » (*Op. cit.* in n. 78, 11.)

The capacity possessed by humoral vices to produce many different kinds of effect on different organs at different times (their so-called proteism) was seen by Pujol and Amoreux as a further reason for keeping them within the field (Louis and Pagès cited this as a reason for discarding humoral vices as bearers of real hereditary influences). Following the « transformations » of humoral hereditary diseases from generation to generation within a family, they argued, would eventually lead to a reduction of hereditary influences to a small set that could account for the diversity observed (87). Hereditary causes then are not only reduced in number but also gain in « extension ». Dispositions to different diseases need not each have a particular humoral cause, but perhaps only a particular effect upon an organ or tissue. All hereditary diseases might still depend on constitutional flaws, but they would need a tainted humour as a vehicle for nonspecific transmission. Antoine Portal took this position to an extreme when he wanted all hereditary diseases to be caused by one polymorphous vice, the scrofular (88).

Contrary to the claims of both Pujol and Amoreux, their dual causal approach to the hereditary left too much room for all kinds of diseases to be considered, one way or another, as hereditary. This proliferative and unbounded character — as both author's rich classifications show (89) — was precisely what some judges objected to, and which lay at the root of the Royal Society's formula « *Maladies vraiement héréditaires* ». That is why they lost the competition.

The curability of some hereditary diseases was also considered by them at the root of the defence of humoral causes. It was widely believed amongst 18th-century physicians that humours could

(87) Contrary to Pagès, both these authors accepted as hereditary a whole range of very different diseases, most of which adopted familial patterns. The idea of following these transformations in time was taken from some ancient authors, and was later redeployed by several 19th-century hereditarians and advocates of degeneration. See for this Daniel Pick, *Faces of degeneration* (Cambridge : Cambridge Univ. Press, 1989) and Ian Dowbiggin, *Inheriting Madness* (California Univ. Press, 1991).

(88) Antoine Portal, *Considérations sur la nature et le traitement de quelques maladies héréditaires, ou de famille* (Paris : Mémoires de l'Institut national de France, 1808.)

(89) Amoreux considers a list of 31 different kinds of diseases, and to most of them he grants « heritability ». Pujol mentions at some point the existence of an « *échelle d'hérédité* » of diseases, in which all known ailments can be accomodated according to their capability of being inherited.

more easily be altered by medical treatments than solids. The former could be acted upon by both nutritional, chemical, and some therapeutical means (like blood-letting) whereas most of the latter were incurable, and only the symptoms could be ameliorated.

But I believe that in the end the disagreement between the two sides in this humoral-solidist dispute was not so much about what kind of physiological interactions the different constituents of the body might possess between them, but rather about a way to classify them that privileged some as authentically capable of hereditary transmission, and left the rest in another category. The obscurities surrounding generation, and the impossibility of tracing the details of physiological interactions forced the decision of how to define the hereditary in the direction of external evidence, which could not in the end tip the balance one way or the other, but only draw some limits or boundaries. It was in the clarification of these boundaries, with regard to pathological evidence, that 18th-century French physicians made their mark.

3 / *The challenge to the appeal to hidden and indirect causation, and latency of hereditary influences*

Homochrony, we saw above, was the clearest of « external » criteria for the hereditary. But it was only one manifestation of the main characteristic that hereditary causes had been seen to possess : latency, or the ability to hide for some time in a healthy body without any sign or symptom. Atavism, of course, was the other important manifestation of this property linked to hereditary transmission. In their attempt to establish the category of « *maladies vraiement héréditaires* » most competitors for the Royal Society's prize realized they needed to give some attention to the special status of hereditary causation.

Louis had discarded as absurd any indirect or mute causation. In particular he could not conceive of a morbid cause (be it constitutional or humoral) that could remain quiet for an entire lifetime (or several) and only manifest itself at a future generation. The transmission of predispositions rather than of actual diseases, as he himself could see, was the answer. Derived, as we said above, from Aristotelian potencies, the idea of a latent cause was in need of a credible description that might give it some substance in order

to transcend the hypothetical status. Most physicians seemed confident that through a distinction between kinds of causes the problem could be solved. Fernel had, two centuries earlier, provided the basic frame : that a hereditary (predisposant) cause needed to be supplemented by a triggering, efficient cause, whose absence would leave the former one mute. What most competitors tried then to do was to flesh up the scheme based on their physiological biases. Materialist approaches to causation were favoured by most of them, both humoralists and solidists (90).

Under a humoral account, latency is best explained by the permanence in the body of the tainted fluid *(vice, levain)* for an indefinite time without acting noxiously on any of its parts (this gives a sort of predisposition). It is only when at some stage of the development of the solid parts, that one (or several) of them becomes vulnerable to the ill action and that the disease develops. Other triggering causes can be external (— emotional, physical, climatic, etc. (91). According to Pujol, this explanation of latency was first proposed by Gaubius (92).

The solidist explanation of latency was described above. An inherited conformational mark gives the predisposition, and a complementary cause (developmental or external) triggers the disease. In any case, secondary, triggering causes were given a quite important role in the manifestation of the hereditary. They had however a non-decisive role, as the variability of reaction within groups and families proved :

« *Tout étant egal* (wrote Amoreux) *les causes secondes agiront de même sur des sujets egalement disposés, elles agiront différement sur des sujets différement disposé, ce qui explique pour quoi dans une famille tous les enfants ne sont pas toujours atteints de la maladie de leur peres* (93). »

Authors could shed doubts over the possibility that either morbid humours or constitutional defects could really remain hidden in

(90) Amoreux, for instance, stressed that an important thing about both humoral and solidist causes is that they avoid all plastic, immaterial efficient forces, *archées*, etc., which he considers « empty » notions : « ... *cette substitution des mots,* he wrote, *n'a jamais donné une idée plus claire de la chose.* » (*Op. cit.* in n. 78, 13.)

(91) « *Les causes accesoires decident plus promptement le principe des maladies à se developper [...] tel es l'abus ou l'erreur dans les choses dites non naturelles.* » (*Ibid.*, 11.)

(92) Pujol, *op. cit.* in n. 4, 326.

(93) Amoreux, *op. cit.* in n. 78, 12.

a healthy individual for long periods of time. The idea of a predisposition itself, and of its being hereditarily transmitted, could also be attacked from a high, aprioristic ground. But to most 18th-century French medical men these ideas provided an excellent resource for picturing the most irregular and untamable of their empirical set of observations.

In this case too, the analogy with the normal helped reinforce their belief. Homochronous phenomena (like dentition and puberty) on the one hand, and latent hereditary transmissions (like familial male baldness received from the mother) on the other, could respond to an analogous kind of latent causation like the one they were advocating.

4 / *The general challenge to the need for a special category of hereditary diseases*

« *Les Maladies Vraiment Héréditaires* », as the French Royal Society of Medicine declared in 1791, a few months before its dissolution, was a category still in search of a precise definition. The stinging effect of Antoine Louis' arguments, together with the perceived stalemate in generation studies, had made it evident to the best prepared members of the French medical community, that if they were to preserve their cherished belief in hereditary transmission of all those mysterious diseases that seemed somehow to burst out spontaneously in some individuals within some families, then they had to give ever more clearcut characterizations of their main features, of their etiology and development. Chronic, constitutional diseases that once seemed impossible to eradicate, like gout, epilepsy, apoplexy, mania, or tuberculosis, were very difficult to account for except by a deep-rooted predisposition in the body. The category of a hereditary disease was one needed by the medical community, in part to account for its failure to prevent or cure this set of maladies (94).

(94) As Ackerknecht has rather sternly put it : « ... heredity has always been the facile way of explaining the inexplicable. » (E. A. Ackerknecht, *History and geography of disease* (New York : Haefner, 1965), 63.) For an excellent recent exposition of the role of predisposing causes in the medical debates of the early 19th century see C. Hamlin, Predisposing causes and public health in early 19th-century medical thought, in *Social History of medicine,* 5 (April, 1992), 43-70.

The discussion then had to be focused not so much on the reality of hereditary transmission but on the conformation of the theoretical space that was to describe them. To include more phenomena than were truly necessary, or in other words, to have a category of hereditary disease so loosely defined as to have room for all diseases with some familiar pattern, was absurd. Restrictive conditions based on the communication mechanism or route were needed, but the restrictions themselves had to be checked so that the category would not become impossible, as Louis had tried to make it.

Pujol and Amoreux, the more enthusiastic defenders of wide-range inclusion, saw the creation of some kind of gradient, or set of sub-classifications based on kinds of causes and intensity of effects, as the solution to the riddle. Amoreux proposed for instance four orders of truly hereditary diseases, the first two of which are basically humoral, while the second two are solidist in cause, although he was reluctant to offer further clarification :

1. Those that are transmitted specifically, without a change of nature;
2. Those (unspecific) that have an hereditary origin but change their nature;
3. Essential bodily dispositions;
4. Bodily deformities that are transmitted and are indelible.

Falsely hereditary diseases he considered to be all those products of accidental occurrences during pregnancy, non transmittable bodily defects, like « *taches* », and all those opportunistic diseases that emerge from a weak constitution but that are not determined in any way (95). This was still not enough to satisfy the stern Royal Society judges, and only the prudence of Rougemont and Pagès seems to have satisfied them here. Their rigorous restriction of the category of hereditary diseases (permitting only the most obviously constitutional and chronic ones), leaves however a residual problem of how to account for the widespread occurrence of familial patterns that are not easily accountable for by external contagions. The discussion around transmission through nourishment pre- and post-partum (through mother's blood and the nurse's milk) falls into this unstable domain. Again, the lack

(95) See Amoreux, *op. cit.* in n. 78, 27.

of a clear physiological description precludes the closure of the debate. The assault on the hereditary by those wishing to account for all its target phenomena through external causation was still an open possibility.

However the set of distinctions (congenital-connate), external observational criteria (homochrony) and causal analysis (latency), that most French physicians had agreed upon by the end of the 18th century seems to have given them a strong-enough base for belief in a kind of independently describable system of transmission of physical peculiarities from parents to offspring that, in a de-pathologized way, could by synthetically refered to as *Hérédité*.

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