CHAPTER IX

Diseases of Silk-Worms

At the commencement of the year 1865 the epidemic among silk-worms had become so acute that the sericultural industry of France was seriously threatened. Eggs, worms, chrysalides and moths were all liable to be affected. The trouble was characterised by the presence of a microscopic object called the "vibrant corpuscle," or "Corpuscle of Cornalia," after the scientist who first observed it; while the malady became popularly known as *"pébrine,"* from the patois word *pébré,* pepper.

It appears to have been through the advocacy of M. Dumas that M. Pasteur was appointed by the Minister of Agriculture to investigate the matter, and no one can have attended a popular lecture on the subject without having been informed that Pasteur's work redeemed for his country more money than the war indemnity wrung from France by the Germans after 1870. What really happened was that Pasteur's luck stood him in extraordinarily good stead. Had Professor Béchamp not provided him with the elucidation of the silk-worm mystery a very different story might have been told.

Nothing better illustrates the remarkable acuteness of Béchamp's intellect than the rapidity with which he solved the cause of *pébrine* and suggested a preventive. Although he was entirely unassisted and obliged to defray any entailed expenses out of his own pocket, already in the year 1865 he was able to state before the Agricultural Society of Hérault that *pébrine* was a parasitical disease and that creosote could be used to prevent the attack of the parasite.

Meantime, however, M. Pasteur had been entrusted by the Government with an investigation, and no one who understands anything of departmental red tape will wonder that, instead of at once accepting Béchamp's verdict, agricultural societies waited to hear the pronouncement of the official representative. Plenty of patience had to be exercised.

M. Pasteur arrived on his mission at Alais in June 1865, having, as he stated before long in his Note to the Academy of

Science,[1] "no serious title" to his fresh employment owing to his ignorance of the subject. "I have never even touched a silk-worm," he had written previously to M. Dumas, and the perusal of an essay on the history of the worm by Quatrefages comprised his study up to June 1865.

Yet, as some statement was expected from him, he managed to address a Communication to the Academy of Science on the 25th September of the same year in which he gave vent to the following extraordinary description:[2] "The corpuscles are neither animal nor vegetable, but bodies more or less analogous to cancerous cells or those of pulmonary tuberculosis. From the point of view of a methodic classification, they should rather be ranged beside globules of pus, or globules of blood, or even granules of starch than beside infusoria or moulds. They do not appear to me to be free, as many authors think, in the body of the animal, but well contained in the cells. . . . It is the chrysalide, rather than the worm, that one should try to submit to proper remedies."

One may well imagine that such a description evoked ridicule from Professor Béchamp, who scornfully wrote:[3] "Thus this chemist, who is occupying himself with fermentation, has not begun to decide whether or no he is dealing with a ferment."

What Pasteur had done, however, was to give a detailed description that was wrong in every particular. There for a considerable time he left the matter, while the deaths of his father and two of his daughters intervened, and he received the honour of being invited as a guest to spend a week with the Emperor and Empress at the Palace of Compiègne.

Napoleon III was, we are told, deeply interested in science. At any rate he and the Empress listened with condescending politeness to Pasteur's discourses. The latter was not only brought into close contact with eminent diplomatists and the shining lights of art and literature, but was singled out from among these celebrities for special Imperial favours. His silk-worm perplexities were confided to Eugénie, and that gracious lady encouraged him to fresh endeavours. Limelight is invariably thrown upon those smiled upon by Imperial personages, and it is easy to understand the increasing deference that began to be shown to Pasteur by most of his compeers. As regards the silk-worm diseases, instead of being watchful for the correct verdict, the

[1] *Comptes Rendus* 61, p. 506.
[2] *C. R.* 61, p. 506.
[3] *Les Grands Problèmes Médicaux, par A. Béchamp,* p. 7.

world at large merely waited to hear what M. Pasteur had to say on the subject.

In February 1866 the latter again started for that part of France then suffering from the trouble, and this time fortified himself with the company of scientific assistants. The Government again gave all the help possible, and the Minister of Public Instruction granted special leave of absence to M. Gernez, a Professor at the College of Louis le Grand, so that he might be free to help Pasteur. Yet in spite of all this assistance, and notwithstanding extra early rising, his biographer has to admit that the results Pasteur arrived at "were being much criticised."[1] His actual pronouncements his son-in-law has wisely passed over and instead has introduced various topics to divert the attention of the reader who persists in asking: "What was Pasteur's solution of the silk-worm mystery?"

Fortunately, lovers of truth can find the exact answers in the Reports of the French Academy of Science. The first one to turn to, however, is a Note not by M. Pasteur but by Professor Béchamp, which comes under the date of the 18th June, 1866.[2]

In the midst of his strenuous professorial duties and his constant researches in other directions, Béchamp snatched time to send up to the Academy fuller details of the disease *pébrine* and measures for preventing it. His note was entitled "On the Harmlessness of the Vapours of Creosote in the Rearing of Silk-Worms." He repeated the pronouncement he had made the previous year and clearly stated: "The disease is parasitical. *Pébrine* attacks the worms at the start from the outside and the germs of the parasite come from the air. The disease, in a word, is not primarily constitutional." He went on to explain how he developed the eggs, or the seeds as they are called, of the silk-worms in an enclosure in which the odour of creosote was produced from a very minute dose of the drug. The eggs thus hatched were all free from *pébrine*. As Professor Béchamp never committed himself to statements until he had proof positive, we find in this verdict upon *pébrine* the decisive clearness that characterises all his opinions.

Pasteur was still so much in the dark that he had not even the acumen to gauge the correctness of the views of the great teacher of Montpellier. But this Note of Béchamp's was, no doubt, a trial to him. Here was another worker pronouncing upon a subject

[1] *The Life of Pasteur*, by René Vallery-Radot, p. 133.
[2] *Comptes Rendus* 62, p. 1341.

that had been officially relegated to him and hallowed by the blessing of the beautiful Empress. Accordingly, on the 23rd July, 1866, Pasteur unburdened himself of a Statement to the Academy of Science on the Nature of *Pébrine*.[1] It was entitled "New Studies on the Disease of Silk-Worms." And here we must look for the great discovery said to have been provided by Pasteur for "the salvation of sericulture." It was this: "The healthy moth is the moth free from corpuscles; the healthy seed is that derived from moths without corpuscles." Such an obvious conclusion is laughable! Still, as it could not be condemned as incorrect, it would have been as well for Pasteur to have ventured no farther. Instead he proceeded: "I am very much inclined to believe that there is not actual disease of silk-worms. I cannot better make clear my opinion of silk-worm disease than by comparing it to the effects of pulmonary phthisis. My observations of this year have fortified me in the opinion that these little organisms are neither animalcules nor cryptogamic plants. It appears to me that it is chiefly the cellular tissue of all the organs that is transformed into corpuscles or produces them." Not a single proof did he bring forward of a fact that would, if true, have been marvellous: not a single suggestion did he give of any experiment to determine the asserted absence of life in the corpuscle or their relation to the disease. Finally, he went out of his way to contradict Béchamp, and in so doing set a definite seal on his blunder. "One would be tempted to believe, especially from the resemblance of the corpuscles to the spores of mucorina, that a parasite had invaded the nurseries. *That would be an error.*"

This intentional dig at another worker was singularly unlucky, for it provides proof positive of the lie direct given by Pasteur to a correct solution to which he afterwards laid claim. Here was the man who had so utterly renounced his former sponteparist views as to ascribe all fermentative effects, all vital phenomena, to air-borne causes, now denying the extraneous origin of a disease that was proved by Béchamp to be undoubtedly parasitic.

The latter at once fortified his conclusions by an account of the experiments upon which he had based them. On the 13th August, 1866, he presented a Note to the Academy of Science: "Researches on the Nature of the Prevailing Disease of Silk-Worms."[2] In this he described a process of washing the seeds

[1] *Comptes Rendus* 63, p. 126-142.
[2] *Comptes Rendus* 63, p. 311.

and worms, which gave proof that those affected had been invaded by a parasite. In answer to M. Pasteur he declared that the vibrant corpuscle "Is not a pathological production, something analogous to a globule of pus, or a cancer cell, or to pulmonary tubercles, but is distinctly a cell of a vegetable nature."

Again, on the 27th August, another Note to the Academy[1] described experiments that proved the vibrant corpuscle to be an organised ferment.

Later, on the 4th February of the following year, 1867, a fresh Memoir sent to the Academy[2] detailed more experiments that not only showed the corpuscle to be a ferment, but also that after the inversion of sugar, fermentation went on, producing alcohol, acetic acid and another non-volatile acid.

In January, 1867, Pasteur, who had been away, returned to Alais, apparently at last enlightened by Professor Béchamp's explanations. In a letter to M. Duruy, the Minister of Public Instruction, he seems to have started to take to himself credit for solving the mystery of the silk-worm trouble. This would account for the almost pathetic plea put forward by Béchamp for a recognition of his outstanding priority in providing a correct scientific explanation.

The latter now, on the 29th April, 1867, provided the Academy of Science[3] with an even fuller account in which he stated his opinion that the vibrant corpuscle was a spore, and demonstrated that it multiplied in an infusion of dead worms, chrysalides and moths, and that creosote diminished this multiplication. He added to this Note a plate of designs of the microscopic examination of this reproduction of corpuscles. "Thus," he said, "is completed the parasitic theory of *pébrine* for the triumph of which I have struggled for nearly two years. I venture to hope that the priority of the idea and of the experiments that have demonstrated it will not be disputed." He showed that up to the previous August he had been alone in holding his opinion, with the exception of M. Le Ricque de Monchy, to whom he expressed gratitude for his encouragement and able assistance.

Alas for Béchamp! Pasteur was unhappily devoid of a similar habit of rendering due honour. Convinced against his will by the Professor's irrefutable proofs, there was nothing for him but

[1] *Comptes Rendus* 63, p. 391.
[2] *C. R.* 64, p. 231.
[3] *C. R.* 64, p. 873.

to turn a complete *volte face,* as he had done before when Béchamp incontestably proved the erroneousness of belief in spontaneous generation.

On the self-same 29th April, 1867, we find among the Reports of the Academy of Science[1] a letter from Pasteur to Dumas, dated Alais, 24th April. In this Pasteur feebly excused his mistake on the score that he had held his erroneous view in good company with "many persons of great repute," and he also pleaded the impossibility of recognising the mode of reproduction of the corpuscles. Instead of any acknowledgment to Professor Béchamp for his full illuminating revelations, Pasteur coolly expressed a hope that he himself would soon be able to present an almost complete study of the disease. His omission to do so then and there seems a noteworthy proof of a continued want of clear understanding.

We find among the Reports[2] of the 20th May, 1867, a letter addressed to the President of the Academy of Science by Béchamp, dated the 13th May, on the subject of Pasteur's Communication of the previous April. He pointed out the error of Pasteur's former views and vindicated his own priority in discovering the true nature of the corpuscles and their mode of reproduction.

On the same date he brought forward[3] "New Facts to Help the History of the Prevailing Disease of Silk-Worms and the Nature of the Vibrant Corpuscle." Here he claimed that the corpuscles were air-borne and to be found on mulberry leaves, the greatest care therefore being necessitated in the preparation of leaves destined for the food of the worms. But the most noteworthy fact of this Memoir concerns the part in which Béchamp distinguished another silk-worm disease from that of *pébrine.* Observations had already been made by the naturalist M. N. Joly upon the presence of vibrios in the intestinal canal of sick worms, to which the name of *morts-flats* or *resté-petits* had been given, but as much ignorance prevailed in regard to this disease, which came to be known as *flacherie,* as had existed over *pébrine.*

On the 11th of the previous April Professor Béchamp had already published a pamphlet on this second silk-worm disease, and afterwards, in July 1868, forwarded his account to the Academy of Science, which inserted a reference to it.[4] In this

[1] *Comptes Rendus* 64, p. 835.
[2] *C. R.* 64, p. 1042.
[3] *C. R.*, p. 1043.
[4] *Comptes Rendus,* 67, p. 102.

pamphlet he wrote: "A non-corpuscular seed may and often does contain, as observed by M. de Monchy and by me, other products besides the spherules of the vitellus and the fatty globules. They are the motile points, much smaller than all the others that surround them, and often excessively numerous. We call these motile points *microzyma aglaiæ* temporarily, until we determine positively their significance. To sum up, as long as their parents are unknown the best course will be to procure seed only that is not corpuscular, either internally or externally, and that is free from the *microzyma aglaiæ*."

In his Communication of the 20th May he went farther in his description and showed that in this other disease the vibrant corpuscles might be entirely absent, while, instead, motile particles were noticeable, like those he had observed in chalk and equally minute, and on these he now bestowed the name *microzyma bombycis* on account of the way in which they were coupled two by two, like a figure of eight.[1]

The next Reports that we find on the subject of silk-worm disease come under the date of 3rd June, 1867.[2] They are two letters from Pasteur addressed to M. Dumas. Regarding the first the writer has to make a curious explanation. It is dated "Alais, 30th April," and in a note Pasteur says that this letter left Alais on the 4th May and that by a postal error it only reached Dumas on the 22nd May. Be that as it may, the 30th April is, anyway, posterior to the 11th April, when Professor Béchamp had put forward his first explanation of *flacherie*; neither does Pasteur in his letter do more than allude to the corpuscular malady as not being the only torment of sericulture. As a safeguard to *pébrine* he put forward his system of taking seed only from moths free from corpuscles, which, as Béchamp pointed out,[3] was an absurdity, considering the parasitic nature of the complaint and the fact that the parasites abounded on mulberry leaves.

The other letter to Dumas, published on the 3rd June, 1867, was dated Alais, 21st May. Here Pasteur stated that another trouble was often wrongly confounded with *pébrine* "because in a great number of cases the two diseases had no connection, *or at least not directly*."

Considering the complete disparity of the two complaints, as

[1] *Les Grands Problèmes Médicaux, par A. Béchamp,* p. 26,
[2] *Comptes Rendus* 64, p. 1109, and *C. R.* 64, p. 1113.
[3] *Les Grands Problèmes Médicaux,* p. 25.

already shown by Béchamp, the vibrant corpuscles being often entirely absent in the case of *flacherie,* this comment of Pasteur's is noteworthy as showing that he did not possess his rival's comprehension of the subject.

Béchamp meanwhile worked hard and sent to the Commission on Sericulture a Memoir entitled: "On the Transformation of the Vibrant Corpuscle of *Pébrine* and on the Nature of the Disease called *Resté-Petits.*" This important communication the Academy of Science published only in abstract on the 10th June, 1867; while on the 1st July of the same year the Academy published another Memoir, also first sent by Béchamp to the Commission on Sericulture, and entitled: "On the Saccharification of the Vibrant Corpuscle of *Pébrine.*" Here he gave a full description of the corpuscle, showing it to lose its oscillating movement in a solution of caustic potash, but to be insoluble in this liquid. He found it to be soluble in sulphuric acid on boiling, and proved that glucose could be produced from it by successive treatment with sulphuric acid, barium carbonate, alcohol and water, and came to the conclusion that the vibrant particle contains cellulose.

From Pasteur, the official inquirer into the diseases of silk-worms, the Reports of the Academy of Science provide no further communication on the subject for almost a twelvemonth.

From Béchamp, on the contrary, a series of Memoirs show the way in which his detailed, persevering work on micro-organisms led to his final comprehension of the silk-worm disease called *flacherie.*

He had already, on the 2nd April, 1867, sent up a note to the Academy on "Microscopic Organisms in Saliva." The matter was so new and unexpected that only a *résumé* was given.[1]

On the 24th February, 1868, he sent up a Note on "The Molecular Granulations (microzymas) of Ferments and of Animal Tissues."[2] Here he drew attention to the micro-organisms to be found in vaccine virus, a plagiarised confirmation of which was given by M. Chauveau.

On the 2nd March, 1868, a Note on "The Molecular Granulations (microzymas) of the Cells of the Liver."[3]

On the 4th May, 1868, "On the Origin and Development of Bacteria."[4] This was a general demonstration of bacterial development from the anatomically elemental microzymas.

[1] *Comptes Rendus* 64, p. 696.
[2] *C. R.* 66, p. 366.
[3] *C. R.* 66, p. 421.
[4] *C. R.* 66, p. 859.

It was on the 8th June, 1868, that he applied all the preceding facts to the disease of *flacherie* in a Note "On the Microzymian Disease of Silk-Worms."[1] Here he stated *flacherie* to be hereditary owing to the abnormal development of the inherent elemental microzymas of the silk-worm. He showed that the microzymas might be seen singly or associated in chaplets, or in the form of very small bacteria. To see them a very high power of the microscope was needed, nothing less than obj. 7, oc. I, Nachet. He stated that the microscopes supplied to workers by the Government were not strong enough. He showed that microzymas and bacteria might exist in the same worm, but it appeared worthy of attention that the number of microzymas was in an inverse ratio to that of the bacteria. It was useless to take seed from moths with the complaint, which was distinguishable by an examination of the contents of the abdomen. He pointed out that to isolate the microzymas they should be treated with a preparation of caustic potash, which, dissolving everything else, would leave the elemental micro-organisms.

Thus, as he had at first fully explained the cause and the mode of prevention of *pébrine,* so now Professor Béchamp made an equally clear and complete explanation of the second silk-worm disease, *flacherie.* He showed that, unlike *pébrine,* it was not caused by an extraneous parasitic invasion, but was due to an abnormal unhealthy development of the microzymas in the body-cells of the silk-worms. The sericultural trouble had given him a chance to demonstrate his full understanding of disease conditions. He was able to provide a clear exposition of, on the one hand, a parasitic complaint, and on the other of one due not to a foreign agent, but to a diseased status of anatomical elements.

Pasteur was well acqainted with all the Notes published by Béchamp, but, regrettably to say, had not the generosity to spare praise for his rival's great scientific triumph. It is undeniable that his thought was of himself and how he could best vindicate his own pretensions.

Béchamp's explanation of *flacherie* appeared, as we have shown, among the Reports of the Academy of Science on the 8th June, 1868. On the 29th June the Reports include[2] a letter to M. Dumas from M. Pasteur dated 24th June, 1868, Paillerols, Commune de Mées, Basses-Alpes. Here it is extraordinary to find that he actually dared to claim that he had been the first to draw attention to this second silk-worm disease and distinguish

[1] *C. R.* 66, p. 1160.

[2] *Comptes Rendus* 66, p. 1289.

it from *pébrine.* He wrote to M. Dumas: "You know that I was the first . . ." But no doubt realising that the Academy Reports were destitute of any such proof, he demanded the insertion of the full text of a Note that he claimed to have sent on the 1st June, 1868, to the Agricultural Society of Alais. It was duly inserted with Pasteur's letter, and was entitled: "Note on the Silk-Worm Disease commonly known as *Morts-Blancs* or *Morts-Flats.*"

The perusal of these Communications by Pasteur brings home the marvel that he was able to impose upon the world the idea that *he* had elucidated the diseases of silk-worms. Just as he had been astray in regard to *pébrine,* so, even now after all the time he had been at work, he had nothing valuable to impart about *flacherie.* He referred to the organisms associated with the disease without any allusion to the fact that M. Joly of the Faculty of Science of Toulouse, as well as Professor Béchamp, had observed them long before him. He thought there was nothing to show that these organisms caused the complaint, but that they were the result of digestive trouble. "The intestine," he wrote, "no longer functioning, for some unknown reason, the materials it encloses are situated as though inside an immovable vessel."

Béchamp, naturally, felt obliged to answer Pasteur; and so among the Reports of the French Academy of Science,[1] on the 13th July, 1868, we find a Note from the Professor: "On the Microzymian Disease of Silk-Worms, in Regard to a Recent Communication from M. Pasteur." Here Béchamp refers to his previous pamphlet, published on the 11th April, 1867, in which he and M. Le Ricque de Monchy had drawn attention to the organisms associated with *morts-flats.* He refers to his past Communication of the 13th May, published among the Academy Reports of the 20th May, and also to his Note of the 10th June, 1867. He shows how again on the 28th March, 1868, he published a second edition of his pamphlet, to which he added further opinions on the microzymian complaint, otherwise *flacherie.* He also draws attention to the fact that as far back as the 4th July, 1867, a member of the silk-worm industry, M. Raibaud l'Ange, had written to ask to be allowed to visit him at Montpellier to study the disease.

Pasteur responded by calling M. Raibaud l'Ange to his help, only for the latter to confess that he had visited Montpellier for

[1] *Comptes Rendus* 67, p. 102.

the desired object. Yet such was the fear of offending the Government representative, the man honoured by Imperial patronage, that M. Raibaud l'Ange, all the same, championed Pasteur with flattery and ridiculed the microzymas.[1]

Béchamp replied to M. Raibaud l'Ange on the 17th August, 1868, reminding him of the table of designs that had accompanied his note of the 8th June, 1867.[2]

No one replied.

As Béchamp afterwards said,[3] the Academy might submit to plagiarism, but no one could deny it.

No doubt it was the total inability to set aside Béchamp's just claims that made Pasteur so hate his brilliant rival from this time henceforward. Béchamp's extraordinary success in dealing with the silk-worm diseases was all the more remarkable because he had no help pecuniary or otherwise from the Government, and no time to expend on the problem except what he could snatch from a professorial career that was filled with work quite apart from any of his scientific researches.

Pasteur, on the other hand, had Governmental help at his instant disposal, every expense defrayed and scientific assistants. Moreover, he was given complete leisure to carry out his researches. That another should have so signally succeeded where he had failed must have been a source of bitterness to him, and his jealousy led him into a veritable persecution of Béchamp. He was sure of his own position, which had the highest influence to back it, and we may be certain that he did not allow himself to pass from the memory of his Imperial patrons. He commenced his book on vinous fermentation with a foreword to the Emperor, while a dedicatory letter to the Empress in the same way prefaced his book on the disease of silk-worms. We may search in vain through this for any generous reference to the first great elucidator of these troubles. Instead, he takes all the credit to himself[4] and even goes out of his way to deride Béchamp's arguments in favour of creosote as a preventive.[5]

But there is truth in the Yankee dictum that you may fool all the people part of the time and part of the people all of the time, but never all of the people all of the time, and so Pasteur's selfish claims must completely fall to the ground in face of the

[1] *Comptes Rendus* 67, p. 301.
[2] *C. R.* 67, p. 443.
[3] *Les Grands Problèmes Médicaux*, p. 29.
[4] *Études sur la Maladie des Vers-à-Soie, par L. Pasteur*, p. 11.
[5] *ibid.*, p. 47.

scientific reports to which we have given reference, and which are available to anyone, for instance, in the Library of the British Museum. These incontestably prove that the man who made such gains for France in regard to aniline dyes was also the man who provided his country with the correct diagnosis of the silk-worm diseases and suggested methods of prevention.

Unfortunately, practical measures were left to Pasteur, and the best commentary upon these are facts in regard to the sericultural industry put forward by Dr. Lutaud,[1] at one time Editor of the *Journal de Médecine de Paris*.

At the commencement of the silk-worm trouble, about 1850, we are told that France produced annually about 30,000,000 kilogrammes of cocoons. In 1866-7 the production had sunk to 15,000,000 kilogrammes. After the introduction of Pasteur's "preventive method," production diminished from 8,000,000 kilogrammes in 1873 to even so low a figure as 2,000,000 kilogrammes of cocoons in certain subsequent years.

"That is the way," says Dr. Lutaud, "in which Pasteur saved sericulture! The reputation which he still preserves in this respect among ignoramuses and short-sighted *savants* has been brought into being (1) by himself, by means of inaccurate assertions; (2) by the sellers of microscopic seeds on the Pasteur system, who have realised big benefits at the expense of the cultivators; (3) by the complicity of the Academies and Public Bodies, which, without any investigation, reply to the cultivators: 'But sericulture is saved! Make use of Pasteur's system!' However, everybody is not disposed to employ a system that consists of enriching oneself by the ruination of others."

Perhaps the greatest harm occasioned by Pasteur's jealousy was the hindrance he set up to notice being taken of Béchamp's work, particularly in regard to his cell doctrine and microzymian theories. So much did Pasteur make it his effort to flout these ideas that actually Members of the Academy, influenced by friendly motives, begged Professor Béchamp to drop the very use of the word "microzyma"! Thus the misfortune came about that, instead of being encouraged, science was held back, and at every turn the Professor of Montpellier found himself hampered in the work that, so he believed, would lay the foundations of cytology and physiology and elucidate the processes of the anatomical elements in birth and life, in health and disease, in death and in disruption.

[1] *Études sur la Rage, par le Dr. Lutaud*, pp. 427, 428.

Who gave the Correct Diagnosis of the Silk-Worm Diseases

Pébrine and Flacherie

BÉCHAMP or PASTEUR?

1865

BÉCHAMP

Statement before the Agricultural Society of Hérault that *Pébrine* is a parasitical complaint and creosote suggested as a preventive of the parasite.

PASTEUR

Statement to the Academy of Science[4] that the corpuscles of *Pébrine* are neither animal nor vegetable. From the point of view of classification should be ranged beside globules of pus, or globules of blood, or better still, granules of starch!

1866

18 June[1]

Statement to the Academy of Science that the disease is parasitical; that *Pébrine* attacks the worms at the start from the outside and that the parasite comes from the air. The disease is not primarily constitutional. Method given for hatching seeds free from *Pébrine*.

13 August[2]

Statement to the Academy of Science describing the parasite as a cell of a vegetable nature.

27 August[3]

Statement to the Academy of Science proving the vibrant corpuscle, *Pébrine*, to be an (organised) ferment.

23 July[5]

Statement to the Academy of Science that one would be tempted to believe that a parasite had invaded the chambers: *that would be an error.* Inclined to believe that there is no special disease of silk-worms, but that it should be compared to the effects of pulmonary phthisis. Little organisms neither animalcules nor cryptogamic plants.

[1] *Comptes Rendus* 62, p. 1341.
[2] *C. R.* 63, p. 311.
[3] *C. R.* 63, p. 391.
[4] *Comptes Rendus* 61, p. 506.
[5] *C. R.* 63, pp. 126-142.

BÉCHAMP **PASTEUR**

1867

4 February[1]

Statement to Academy of Science on further research in connection with *Pébrine* as an (organised) ferment.

11 April

Publication of a pamphlet in which attention was called to another silk-worm disease, that of the *morts-flats*, or *resté-petits*, commonly known as *Flacherie*.

29 April[2]

Statement to the Academy of Science on the vibrant corpuscle, *Pébrine*, demonstrating it to be a spore, and supplying a plate of designs. Hope expressed that the priority of his correct diagnosis will not be disputed.

20 May[3]

Statement to the Academy of Science on "New Facts", and the other silk-worm disease, *Flacherie*, clearly distinguished from *Pébrine*.

10 June

Academy of Science published an extract from a Communication on the two diseases previously sent to the Commission on Sericulture.

29 April[4]

Confession of error in having believed, in company with many persons of great repute, that the vibrant corpuscles, *Pébrine*, were analogous to globules of blood, pus, or starch!

3 June[5]

A letter to Dumas communicated to the Academy of Science. Safeguard against disease is to take seed only from moths free from corpuscles (a statement that proves the parasitical nature of *Pébrine* to have been still uncomprehended by Pasteur). An allusion to the corpuscular malady as not the only torment of sericulture.

[6]Another letter to Dumas communicated to the Academy of Science stating another trouble often to be confounded with *Pébrine*, but that "in a great number of cases the two diseases had no connection *or at least not directly!*" (As they had no connection at all, the uncertainty of his ideas is apparent.)

[1] *Comptes Rendus* 64, p. 231.
[2] *C. R.* 64, p. 873.
[3] *C. R.* 63, p. 1043.
[4] *Comptes Rendus* 64, p. 835.
[5] *C. R.* 64, p. 1109.
[6] *C. R.* 64, p. 1113.

BÉCHAMP	PASTEUR
1869	
A series of publications, winding up with—	
8 June[1]	29 June[2]
A communication to the Academy of Science "On the Microzymian Disease of Silk-Worms," more fatal than *Pébrine,* since creosote could be a preventive of the latter, while the former is constitutional and hereditary. The microzymas are to be seen singly or associated in chaplets or in the form of very small bacteria. No seed should be taken from moths that have the complaint discernible by an examination of the contents of the abdomen under a very high power of the microscope, at the very least the combination obj. 7, oc. I, Nachet.	A letter to Dumas communicated to the Academy of Science claiming to have been the first to draw attention to the disease of *morts-flats* and demanding the publication of a Communication to the Agricultural Society of Alais on the 1st of the current month. The latter follows: Reference to the organisms associated with *Flacherie,* without any acknowledgment of the prior observations of Joly and Béchamp. Considers the organisms to be probably the necessary result of digestive trouble.

COROLLARY

In view of the above, Pasteur's claim of priority in a correct diagnosis of the two silk-worm diseases, repeated on p. 11 of his *Études sur la Maladie des Vers-à-Soie*—IS ENTIRELY WITHOUT FOUNDATION.

[1] *Comptes Rendus* 66, p. 1160.

[2] *Comptes Rendus* 66, p 1289.