



VIII. Report on M. D'Arcet's method of extracting gelatine from bones, and on its application to various œconomical purposes

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To cite this article: Messr. Leroux , Messr. Dubois , Messr. Pelletan , Messr. Dumeril & Messr. Vauquelin (1815) VIII. Report on M. D'Arcet's method of extracting gelatine from bones, and on its application to various œconomical purposes , Philosophical Magazine Series 1, 46:207, 17-21, DOI: [10.1080/14786441508638487](https://doi.org/10.1080/14786441508638487)

To link to this article: <http://dx.doi.org/10.1080/14786441508638487>



Published online: 27 Jul 2009.



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The deflexion of a beam at the time of fracture, is directly as the length, and inversely as the depth.

For then, W is as $\frac{BD^3}{L}$.

Definition. "The stiffness of bodies is measured by their resistance at an equal linear deviation from the natural position." (Young's Nat. Phil. vol. ii. art. 332.)

The stiffness of a rectangular prismatic beam, is directly as the breadth and cube of the depth, and inversely as the square of the length.

Since CD is as $\frac{L^2W}{BD^3}$, by multiplication $BD^3 \times CD$ is as L^2W , and by division $\frac{BD^3 \times CD}{L^2}$ is as W ; but by the definition CD is a constant quantity, therefore $\frac{BD^3}{L^2}$ is as W , or as the stiffness of the beam.

Several experiments were made; but the one described was preferred, because the difference in the length of the pieces was greater than in the others.

I am,

Your most obedient servant,

Red Barn, June 2, 1815.

T. T.

VIII. *Report on M. D'ARCET's Method of extracting Gelatine from Bones, and on its Application to various æconomical Purposes.* By Messrs. LEROUX, DUBOIS, PELLETAN, DUMERIL, and VAUQUELIN*.

M. D'ARCET has presented to the Philanthropic Society some gelatine extracted from bones, by a process which is peculiarly his own, inviting them to employ this substance in the broths and soups which they distribute to convalescents and to the poor.

The Society accordingly nominated a commission, to inquire into the advantages that may be derived from gelatine prepared in M. D'Arcet's manner. After several conferences, in which they were assisted by persons distinguished in chemistry and domestic œconomy, they were at length satisfied that the use of this substance would afford a considerable saving, and of the possibility of roasting for the nourishment of convalescents the greatest part of the meat that is otherwise employed in making the broth.

But as the Society never adopt any new article of food

* From the *Annales de Chimie*.

without previously taking the opinion of the medical faculty, it has submitted to that body the following questions: First, whether the gelatine extracted by M. D'Arcet be nutritive, and to what degree? Secondly, whether it would be salubrious as an aliment, and not liable to any inconvenience?

To these two points the committee have directed their attention; and although the method of preparing the gelatine is not of equal importance with its use as an aliment, we thought it our duty to become acquainted with it; and with this view we visited the manufactory of M. Robert, where it is extracted, and where we witnessed the series of operations to which the bones are submitted, in order to obtain from them the gelatinous matter in a state perfectly pure.

Hitherto the gelatine has been extracted from bones, by submitting them for a long time to the action of boiling water. By this method, which requires the pulverization of at least the larger bones, scarcely one-third of the gelatine contained in them is obtained: they are besides partly deteriorated by the long continued action of the water and heat. These difficulties have hitherto prevented the adoption in hospitals, of broths made from bones.

M. D'Arcet has followed a method entirely opposite. He deprives them, by means of diluted muriatic acid, of the phosphate of lime, and obtains the animal part in a solid state, still preserving the form of the bones. To take from this substance the small portions of acid and fat it retains, he puts it into baskets, and plunges it for a few instants into boiling water: lastly, after wiping it dry with linen cloths, he exposes it to a quick current of cold water, which by cleaning it perfectly, renders it white and demi-transparent.

Without entering into further details on this subject, it is enough to observe that M. Robert's establishment leaves nothing to be desired with respect to cleanliness and salubrity in the preparation of this substance.

When thus prepared and cut into pieces, the gelatine dissolves very quickly and almost entirely in boiling water. If it is wished to preserve it to use at a distant time, it is sufficient to expose it upon hurdles or nets, either entire or cut up, in a warm and dry place; then inclosed in casks or cases it undergoes no alteration, and may be preserved for a thousand years with all its qualities.

Let us now examine, with a view to œconomy, the advantages of employing M. D'Arcet's gelatine in the preparation of broth. Although this is not the principal object of the author, it is in itself of sufficient importance to merit attention.

It is known that about 100 kilogrammes of meat contain 80 kilogrammes of flesh and fat, and 20 kilogrammes of bones:

100 kilogrammes of meat make in our establishments 400 measures of broth of a demi-litre each. The bones which are thrown away or burnt would give 30 hundredths of dry gelatine; consequently, the 20 kilogrammes above-mentioned would furnish six kilogrammes, from which 600 measures of broth may be produced.

The quantity of broth produced from the bones is therefore in proportion to that from the meat as 3 to 2.

But pure gelatine having no taste of its own, is not sufficiently stimulating to the stomachs of invalids and convalescents: M. D'Arcet, therefore, proposes to season the broth with roots and herbs, to supply the place of the extractive matter, the *osmazone* and the salts of the meat; or, as appears preferable, to substitute the gelatine for three-fourths of the meat.

Thus with 50 kilogrammes of meat as much broth may be made of a good quality, as is usually made with 200 kilogrammes; so that the same expense will afford the same quantity of broth, and three-fourths of the meat, which may be roasted for the convalescents, who naturally prefer it to the *bouilli* of the hospitals, which is nearly reduced to the animal fibres deprived of all the nourishing juice.

Thus the food distributed will be considerably improved by adopting M. D'Arcet's method, without any additional expense.—We will show this advantage by a few examples.

First, 100 pounds of meat afford but 50 pounds of *bouilli*, and 100 pounds of the same meat furnish 67 pounds roasted; there is, therefore, nearly a fifth part gained by roasting it.

Second, 100 pounds of meat furnish 50 pounds of *bouilli*, and 200 measures of broth.

Third, 100 pounds of meat, of which 25 is made into broth, with three of gelatine, will give 200 measures of broth and 12 pounds and a half of *bouilli*, and the remaining 75 pounds will furnish 50 pounds of roast meat.

We see that by this means we have an equal quantity of broth of superior quality, and 50 pounds of roast meat, besides 12 pounds and a half of *bouilli*: indeed we spend seven francs 50 centimes in the gelatine; but this expense is more than covered by the 12 pounds and a half of *bouilli*. We must therefore conclude from these facts, that this process affords not only the means of greatly improving the subsistence of the indigent, but also a degree of æconomy which is not to be neglected.

This being demonstrated, we will now proceed to the principal object of our mission, which more particularly concerns the medical profession, and the only one on which the Society has consulted them; which is, the nutritive properties and salubrity of gelatine.

With respect to the first part of this question, every one who is acquainted with the nature of meat, is convinced that the nutritive property it communicates to the broth, is derived principally, if not entirely, from the gelatine. If daily experience did not furnish undeniable proofs of this, we should find it attested by numberless authors who have written on this subject, and who all consider gelatine as the most nourishing of animal matters. Some persons may object that gelatine cannot supply the place of meat in the preparation of broth, because it is deprived of salts, and of the extract particularly denominated *osmazone*, which gives the colour, taste, and pleasant flavour to broth.

But we reply, that this principle does not exist in veal, poultry, or pork, and yet these meats are very nourishing; and, moreover, M. D'Arcet proposes, as we have before mentioned, to supply the portions of those substances that are deficient in the broth of gelatine, by a greater quantity of roots, such as onions, turnips, celery, carrots, &c. which are savoury, aromatic, and saline.

But the most conclusive experiment, and one to which every one must assent, was that which was made under our own inspection at the medical hospital. The broth was prepared with one quarter of the meat commonly used, gelatine and roots supplied the place of the other three quarters, which were roasted, and given to the invalids and convalescents, and even to the persons in attendance, who perceived no difference between this broth and that to which they had been used: they were also abundantly nourished, and perfectly satisfied to have roast meat instead of *bouilli*.

Here then is one part of the question resolved. The broth made according to M. D'Arcet's process, is at least as agreeable as the broth commonly made in hospitals; as to the other part, namely, the salubrity of the broth, we can affirm that of 40 persons who partook of it for three months, not one of them experienced any symptoms that could be reasonably attributed to the gelatine; the progress of the sick was the same as usual, and the convalescents were not longer recovering than in other circumstances. We may, therefore, without hesitation conclude, that gelatine is not only nourishing and easy of digestion, but also that it is very salubrious; and employed in the way proposed by M. D'Arcet, cannot have any bad effect on the animal frame.

Nor are these the only advantages to be derived from the gelatine extracted in the above manner: there are many others, on which I shall add a few words in this place.

1st. When reduced into thin cakes and dried, it may be used
by

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by wine-merchants in their white wines, also in clarifying coffee, making jellies and creams; and lastly, it may be used instead of isinglass on all occasions.

2d. The gelatine simply dried and cut in pieces, contains a great quantity of nourishment in a very small compass; it may be rendered useful to make soup for sailors during long voyages, for soldiers in besieged towns, and even in camps and barracks.

3d. If made into cakes with a certain quantity of gravy and roots, it will make an excellent dish both for the naval and military officers. M. D'Arcet has shown us some specimens of this preparation, which surpass in beauty and quality all that we have hitherto seen of this kind.

4th and lastly. It can be employed to make glue with more advantage than any other substance that has been used for the purpose; the operation will be much shortened by it, and the glue infinitely better. The tenacity of the latter, according to some experiments made by Messrs. Cadet, Gassicourt, and Jecker, opticians, is to the best Paris glue as 4 to 3, a quality extremely valuable to joiners, cabinet-makers, &c. and especially to paper-makers, who frequently fail in their operations for want of good glue.

It is but justice to add, that M. D'Arcet, by applying to domestic economy a known principle in chemistry, has rendered a real service to humanity; since he has demonstrated the utility, for a number of purposes, of a matter which has hitherto been almost entirely lost.

IX. *Inquiries into the encaustic Painting of the Ancients.*

By M. CHAPTAL*.

PLINY distinguishes colours as *colores austeri* and *colores flaridi*, i. e. colours of a low value, and brilliant and clear colours: he adds that the latter were furnished to the painter by the person who made them; and he places in this class *minium*, *armenium*, *chrysocolle*, *indicum*, and *purpurisum*. The ochres, ceruse, sandarague, and black, are of the former description.

Sinapis was a red earth with which minium was sophisticated.

Melinum, according to the characters indicated by Pliny, appears to us to have been a white clay. Nevertheless the ancients also employed in their fresco paintings the paste of lime, as I have ascertained by analysing some colours used by the ancients. These whites produced by lime have been preserved without alteration. The *melinum* was brought from Melos and Samos; but the latter was too fat, and the painters made but little use of it,

* *Annales de Chimie*, tome xciii. p. 298.