ANATOMY

Brains of Great Men

Heavy and Wrinkled Brains do Not Make Geniuses; It is The Blood Supply That Counts, A Noted Scientist Finds

By JANE STAFFORD

SCIENCE has discovered a new secret of greatness. It has found for the first time a significant difference in physical structure between the brain of the average man and that of the scholar.

This difference is not a matter of the size, weight, or convolutions of the brain, but of its blood supply. And this difference may very well explain why the scholar's brain functioned more brilliantly than that of his less-gifted brother which was as large and heavy.

The difference in blood supply to the scholar's brain and to that of the man in the street and its significance have been brought to the attention of scientists by Prof. Henry A. Donaldson, of the Wistar Institute of Anatomy and Biology in Philadelphia. Prof. Donaldson has for many years been examining the brains of distinguished scientists and other scholars after their death and also brains of patients dying in hospital wards—brains of average or less than average ability and attainments.

Measuring and weighing and dissecting these brains, Prof. Donaldson sought the elusive something that differentiated them intellectually while their owners were alive. He thinks he has found it, or at least a clue to it, in the structure scientists call by the Latin name of *pia mater*.

This *pia mater*—the words mean, literally, tender mother—is a very delicate membrane that covers the brain like a wrapper of cellophane. It is as thin as the finest tissue paper, only much more pliable. It follows tightly the entire surface of the brain, dipping down into the fissures and carrying with it the chief blood vessels of the brain.

If you have ever watched calves' brains being cleaned out and prepared for cooking, you have probably noticed that the cook pulled off blood clots and a thin, white stringy stuff that the clots were attached to. The thin stringy stuff was the remains of the *pia mater,* and the blood was that which had clotted in the veins and arteries after death.

During his examination of the brains in his laboratory, Professor Donaldson carefully removed this membrane, laying it aside for later consideration, while he first examined the brains themselves. He did this because recent studies have shown that the blood vessel arrangement in the pia mater varies considerably in different persons, and that its variations are significant.

This matter of the blood vessels seemed to Professor Donaldson to be of considerable importance. Most of the early studies of the brain, he reflected, considered it only after death, when it was an organ at rest without any driving power. After all, it seemed only natural that the driving power which kept the brains at work should be more important than their shape or size in respect to the quality of work they did.

"Broadly speaking, this driving power which puts the brain to work during life is the blood, and the conditions determining the supply of blood are fundamental," he explained when reporting his views and studies to the American Psychiatric Association.

The best of brains, he pointed out, makes a poor showing in a fainting individual. Fainting is a condition in which most of the blood is withdrawn from the brain.

More Blood, Better Work

A good indication of how well the brain was supplied with blood might be found in the blood vessels of the *pia mater,* he thought. Another scientist, he remembered, B. Hindze, made a special study of these blood vessels in both mentally superior and ordinary persons. He found a positive correlation between the complexity of the blood vessel arrangement and the mental grade. The higher the mental grade, the more elaborate the blood vessel arrangement in the pia mater. While it is not possible to tell about the number of smaller blood vessels surrounding the nerve cells of the brain from the complexity of the larger vessels of the pia mater, it is safe to infer that when the pia mater contains many vessels, the nerve cells are also well supplied.

"There is no question," Professor Donaldson stated, "that the brain, like a muscle, works better with an ample blood supply. So, at last, we have a partial reason why one brain works better than another."

If brain functioning is a matter of nourishment, then not only the quantity but the composition of the blood must play a part. One group of investigators has found that through the blood, the state of the nerve cells in the brain can be greatly changed, and with this change the mental processes show a corresponding range of change. However, only the beginning steps have been taken in this direction. While science may never find a way to increase the number of blood vessels in your *pia mater,* it may some day be able to tell you what to eat to improve your mental ability by improving the quality of blood supplied to your brain cells.

Bumps Thought Important

However, the blood is only one factor influencing mental ability, Professor Donaldson suggested. Other important factors may be the structure and chemical composition of the nerve cells in the brain. So far, however, not much has been discovered about these factors.

Scientists have been trying for over a century to find the thing that made the scholar's brain different from the ordinary man's. Some of the earliest of these studies resulted in Franz Gall's system of phrenology. Gall's work was published in 1810. While Gall's ideas never attained any scientific standing, they attracted much attention and many followers. You have perhaps sometime in the past had some phrenologist "feel the bumps" on your head and after consulting his chart tell you what he found to be your character and intellectual traits.

"Gall associated slight elevations of the cranium with assumed elevations of the brain and assigned a so-called faculty to each of them," Professor Donaldson explained. "On the basis of the relative development of these twenty-six bumps, he proposed to read the character of the individual. Evidently this was merely transferring the current method of the physiognomists from the face to the cranium."

After Gall, came the period when the weight of the brain was considered significant and given much consideration by many students of the problem.

"It was assumed that outstanding personalities should have heavier brains, just as powerful men had heavier hearts," Professor Donaldson said.

This theory received many upsets, however. In a very general way it was found to be true, but there were outstanding cases of men of great ability whose brains actually turned out to be exceedingly lightweight. Lord Byron, the English poet, had, it is true, a very heavy brain, the heaviest on record, weighing nearly five and one-half pounds.

Scholar's Light Brain

On the other hand, Anatole France, French scholar and writer of great ability and renown, surprised the scientists by having a very light brain, which weighed only two pounds, four ounces, which is almost a pound lighter than the brain of the average farm laborer. Another small but powerful brain was Napoleon's. Louis Agassiz, the distinguished American naturalist, had a rather large head but his brain was relatively lightweight weighing just over three pounds.

Besides weight, brains have been studied and measured from other aspects. The complexity of the convolutions and fissures of the brain have been sometimes considered of significance, and the relative size and weight of the various parts have also been given considerable attention.

Another of the early investigators of the problem was Rudolph Wagner, who, in 1860, made a study of three eminent scholars and an artisan. Wagner, and the scientists who came after him, found very little significant difference between the brains of the intellectuals and of the average or less than average individuals. Among the brains of the scholars examples were found of both simple and complex fissuration. After the modern idea of localization of brain functions was established, the search for the cause of great mental ability was eagerly followed along that line. The different parts of the brain were studied separately and in relation to each other.

This study of brains attracted considerable attention and you may remember that it became quite fashionable to bequeath one's brains to some laboratory for study.

Professor Donaldson explains it as follows:

"Some fifty years ago a cry went up from the brain anatomists for 'more and better brains.' With few exceptions their work had been carried on with so-called hospital material and it was thought that if brains from those of somewhat higher mental grade could be studied, some of the bothersome questions might be illuminated.

"This led to the formation of anthropometric societies or similar groups among the intellectuals, whose members kindly consented to bequeath their brains for study.

Untaxed Bequest

"The appeal is attractive for it represents an interest in science and it further represents that rare form of bequest, namely, one which has not yet been taxed."

One of these groups is the Cornell Brain Association at Cornell University, which was founded by Dr. Burt Green Wilder.

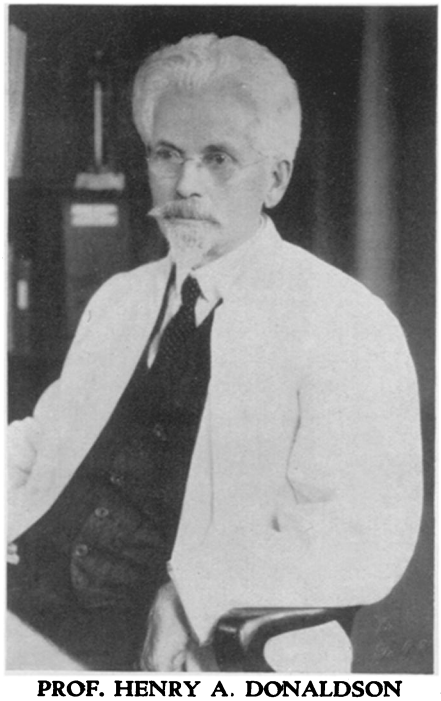
Professor Donaldson's own studies at the Wistar Institute were made on the brains, among others, of Laura Bridgman, the deaf-mute; G. Stanley Hall, the eminent psychologist; Edward S. Morse, widely known naturalist and zoologist; and Sir William Osler, distinguished physician, teacher and author.

Working with these and other brains, Professor Donaldson made all the classical measurements and in addition devised methods of his own for comparing the brains of the élite with those of the average person. He weighed the brain and weighed separately different parts of it. Greater weight in brains is probably due to heavier nerve cells rather than to more of them, he found. While he found higher brain weights more often in the brains of the scholars, he found among these brains nearly the same range of weights as among those of the average hospital patient.

"In the individual case," he concluded, "brain weight is not a real indicator of intelligence."

Besides weighing the brains Professor Donaldson made very careful measurements of brain area, taking into account by a special method the area of the grooves and fissures in the surface. But after considering all these measurements, he concluded that while greater weight may be somewhat correlated with higher grade of brain performance, none of the measurements can be counted on to differentiate brains of superior ability from those of average or inferior ability.

No signs of how well a brain worked are to be found in the dead brain, according to Professor Donaldson's studies, except that in a general way a large-sized brain indicates good growth, which is a favorable sign.



PROF. HENRY A. DONALDSON
He has examined the brains of geniuses, men of average intelligence and idiots.

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