

**AN ESSAY ON THE CONNECTION  
BETWEEN THE ACTION OF THE HEART AND  
ARTERIES, AND THE FUNCTIONS OF THE  
NERVOUS SYSTEM, AND PARTICULARLY  
ITS INFLUENCE IN EXCITING THE  
INVOLUNTARY ACT OF RESPIRATION**

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**JOSEPH SWAN**

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AN *J. H. 1836*  
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## PREFACE.

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VARIOUS have been the opinions respecting the cause of the involuntary act of respiration, but these have hitherto failed of proving satisfactory to the unbiassed physiologist. In the following pages I have stated my own opinions with very considerable hesitation, but as the great secrets of nature are seldom to be revealed but by the succeeding labours of different individuals, so I have contributed, what appeared to me sufficiently important for extending our knowledge, not only

on this interesting subject, but on various points connected with it.

It is difficult to be at the same time concise and clear, and therefore it is difficult in an Essay to touch upon important subjects connected with the main object, and not to acquire an appearance of negligence. I feel it necessary to make this apology, although I have not hastily written this short work.

6, *Tavistock Square*,  
*May 22, 1829.*

AN  
ESSAY, &c.

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MR. HUNTER\* says, "Life I believe to exist in every part of an animal body, and to render it susceptible of impressions which excite action; there is no part which has not more or less of this principle, and consequently no part which does not act according to the nature of the principle itself, and the impressions thence arising, producing thereby infinite variety both in all natural and diseased acts."

Muscles have a power of contraction in themselves, which may be termed their irritability, or their life, and although these are generally called into regular action by connexions with the nerves and brain, and spinal marrow, or the

\* Treatise on the Blood, &c., p. 3.

motion imparted to the nerves by the sanguiferous system, the actions of some of them are in a considerable degree independent of these attachments.

The fœtus in utero moves before the brain and spinal marrow have acquired any sort of perfection of structure; monsters move also, where there is a deficiency of the brain; and some vegetables have a similar power of contraction, which, however, seems to be directed by external agents, and is in some degree like that in the muscles of animals after their nerves have been divided.

It has been observed, that the heart is a beating point in the rudiments of the chick on the fourth day of incubation, and at this time no other parts are particularly developed. The cause of it begins with the application of heat to an egg, which has been impregnated and is endowed with the living principle. This beating point is a phenomenon to be ascribed to one of the laws imparted by the Creator, and for which it is impossible to account by any reasoning. What takes place thus in the egg, takes place also in the uterus

of viviparous animals. As the law of nature commands this first action, so it is ordained that it should commence at different times in different animals. In the evolution of the foetus other parts become gradually developed, and then the heart begins to assume its peculiar office of circulating the materials for modelling the various organs, and bringing them to that state of perfection which is required at their change of existence. At birth the heart is the fountain of the new life, for it first incites to action the parts whose functions are absolutely required for this new state of being.

The great inherent irritability of the heart is not to be attributed to a more complicated distribution of the nerves; and as nature never designed a great multiplicity of agents for accomplishing a purpose for which a few would suffice, it is impossible to view accurately the intricate and elaborate arrangement of its nerves in man without a full conviction that this is unnecessary for its own action. The formation of its nerves, in most animals, is very simple, and shows that this