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Theses Abstracts

THE EARLY DEVELOPMENT OF CLINICAL DIALYSIS: THE IMPORTANCE OF SYMBOLISM IN SUCCESSFUL SCIENTIFIC ENDEAVOURS.

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Abstract of Thesis Submitted for the Degree of Master of Science at the University of Sydney

This thesis presents an account of the series of experiments performed into dialysis by Thomas Graham in 1861; by his immediate successors; by Emil Abderhalden and Fritz Pregl; by the Baltimore group of John Jacob Abel and his Collaborators (1913-15); and by others who were more peripherally involved. Its primary purpose is to demonstrate the roles that each of these investigators played in the development of clinical dialysis. Its secondary purpose is to propose a novel theory of success in the scientific endeavour, and to use dialysis as a case study with which to test this.

An account is presented of Graham's experiments, his development of an idea, and his invention of the word *dialysis* to describe the observations and idea. He recognised that urea - an important uraemic toxin - was dialysable. He established his reputation by a forceful application of observation, conceptualisation, and symbolism to the topics that he investigated.

Several minor figures followed Graham, but were soon forgotten. Then Abderhalden attempted to use dialysis in a test for pregnancy, but based *the Abderhalden reaction* on false assumptions. His observations and his ideation were flawed. Although he developed a symbolic name for his test, it did not work. He lapsed into obscurity. Pregl, however, applied dialysis successfully to *microanalysis* of chemicals. His observations, ideas and symbolism succeeded; he won a Nobel Prize for Chemistry and his procedures entered all modern biochemical laboratories.

Abel was far more complex. His personal laboratory notebooks are held in the Johns Hopkins Hospital archives. A reworking of these is presented and demonstrates that his private aims differed from his public ones. His assistants' intentions also were hardly those of idealistic scientists. His observations were flawed and his ideas confused, but his reputation survived his own misinterpretations because of adulation of his work by a gullible lay and medical press. Perhaps his misinterpretations were fortuitous, but probably they were not. Certainly, they implied clinical applications far beyond those justifiable by the documented records claims which Abel never really denied, and which his assistant Rowntree, actively encouraged. Driven by the publicity, Abel embarked upon a hopeless - and apparently lethal - experiment on a sick young woman. Uninformed about that disaster, community acceptance - the factor crucial to the judgement of experiments as 'successful' - remained uncritically positive. It idolised Abel (in truth, a some-

what hapless scientist) as a brilliant physician and the inventor of *the artificial kidney machine*. His symbolism survived just long enough to enable his successors to link their more reliable observations and ideas with it, to develop these to clinical fruition, and thereby to secure for Abel his place as an apostle of science.

The secondary purpose of this thesis is to propose a *trinitarian* theory of scientific success. Observations, ideas, and symbols are three co-existent and necessary components of a successful scientific enterprise. None is sufficient without both of the others. Observations alone are empty. An astute observer can weld observations together into ideas, but unanchored ideas will float away. Society is most likely to judge an observer as a successful contributor to science if that observer creates appropriate symbols (usually unique words or phrases), with which to fix accurate observations and good ideas - to epitomise their meaning to the public.

An interesting application of this theory relates to the public relations implications of unsubstantiated symbolism. Reluctance to admit this can then so readily promote false observational claims and the temptation of scientific fraud.

Whilst a single case study can at best merely support a hypothesis - it will never prove it - the evidence from dialysis dovetails with the present contentions. Hence their validity may be worth testing against other cases.

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