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## **The (Re)-Introduction of Semiotics into Medical Education: On the works of Thure von Uexküll.**

*John Tredinnick-Rowe*<sup>1</sup>

### **Abstract**

Thure von Uexküll's reputation as a pioneer in biosemiotics and also in psychosomatic medicine is well documented. It is easy to see these disciplines reflected in his notable publications, both in English and in German. However, if one spares the time to filter through all of his articles, monographs, conference papers and editorials in English and in German, a notable gap arises in his English language publications: that of Clinical Education. This gap in the English language literature may seem unimportant in and of itself, but it speaks volumes when we consider the total absence of medical semiotics in the curriculum of medical schools in the English speaking world. This runs in stark contrast to the strong traditions of psychosomatic medicine in Germany, which Thure von Uexküll largely helped to instil. Do the works of Thure von Uexküll offer a possible step towards a resurrection of medical semiotics in Clinical Education? This chapter attempts to explore the lesser known German literature on Clinical Education that Thure von Uexküll produced, and explore the role semiotics can play in Medical Education in the English speaking world. Whilst also seeking to contrast this literature with other existing approaches in British and American medical schools who have attempted to reintroduce medical humanities and reflexive thinking into Clinical Education.

### **Keywords**

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## INTRODUCTION

This paper represents the first tentative steps in the analysis of the German language and English language works of Thure von Uexküll. This paper predominantly focuses on the works of von Uexküll that remain untranslated from the original German. This paper aims to shed light upon some of the less common themes in Thure's work, such as his papers, forewords, book chapters and conference speeches on clinical education. Dozens of publications that make up this body of literature remain untranslated (see appendix 1). It is the author's hope that all the progress that has been made with this endeavour no matter how small will shed some new light on the works of Thure von Uexküll.

### Medicine and Semiotics

Whilst for some the relationship between medicine and semiotics may not seem to be an immediately obvious connection, semiotics and medicine in the western tradition share a common foundation in that they both have a father in the works of Hippocrates<sup>1, p103</sup>. Although as Manetti<sup>2</sup> emphasised, semiotic thinking was also present in pre-Hellenic culture. In a more modern context, moving beyond the ancient world, Western medicine has since the 1800's been dominated by disputes between Empiricist and Rationalist approaches<sup>3</sup>, in the current era the dominant force in medical curricula has been the influence of positivism in the form of biomedical science. However attempts have been made in epidemiology to append the dominant rationalist approach, such as the Biopsychosocial Model<sup>4</sup>. Semiotics however, as the progeny of the Hippocratic tradition has not followed its wayward medical brother and become enamoured with Rationalism, or the Empiricism vs. Rationalism debate. Petrilli and Ponzio<sup>5</sup>, p242 went as far as to state that "*Peirce's semiotics<sup>2</sup> is explicitly anti-Cartesian and rejects the rationalism-empiricism*

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<sup>2</sup> See 6. Peirce CS. Questions Concerning Certian Faculties Claimed for Man. Journal of Speculative Philosophy in CP 5264-5317, 1868:103-14. & 7. Peirce CS. Some Consequences of Four Incapacities Journal of Speculative Philosophy in CP 5317-5357, 1868:193-208.

*dichotomy as sterile and abstract.*” Although some would dispute this (see Stables <sup>8</sup>). Regardless, the subsequently developments have been that semiotics, although from the same Hellenic root as medicine has not found a place in the modern medical school curricula of English speaking countries.

In the 18<sup>th</sup> century works on Medical semiotics were still current, for example one could look at the writings of Russian and German doctors such as Feodorovich and Hippus <sup>9</sup>'s *Semiotik und Diagnostik der Kinderkrankheiten*, or Hufeland <sup>10</sup> who wrote *Ueber den Werth und die Bedeutung der Semiotik* in the Journal of Obstetric Practice, similarly Becker <sup>11</sup> addressed the role of semiotics in relation to cardiology in his *Zur Physiologie und Semiotik der Herzthätigkeit*. Medical semiotics continued into the 19<sup>th</sup> and 20<sup>th</sup> century but by this point medicine and semiotics had become separate disciplines<sup>12</sup>. For this reason English language publications concerning medical semiotics now can only be found in philosophical and not medical texts<sup>13</sup>. As one of the originators of a modern movement in medical semiotics and psychosomatic medicine, Thure von Uexküll's body of literature represents culmination of works that connect medicine and semiotics at the end of the 20<sup>th</sup> century<sup>14-16</sup>.

Working in Clinical Education, and with medical students, the author feels that the absence of medical semiotics in clinical education is a regrettable loss, especially given its common Hippocratic origin. From a professional perspective as a clinical educator, it is the author's conjecture that in line with Cobley <sup>17</sup> humanities subjects such as medical semiotics could have a beneficial effect on medical students and their praxis. Some such as Hudson Jones and Carson <sup>18</sup> have suggested that the role of humanities in clinical education is to encourage ethical and empathetic traits in doctors, a statement that has been met by others with scepticism<sup>19 20</sup>. Perhaps a less speculative aspiration comes from Macnaughton <sup>21</sup>,p25 who suggest that *“Philosophy (which is also important in the non-instrumental context) can teach students to order their thoughts, construct an argument and reach a logical conclusion.”* The author's feelings are more in line with this statement and Shapiro, et al. <sup>22</sup> who suggested that medical humanities could improve the analytical skills of doctors. For this reason medical semiotics might be one of the most relevant disciplines in the humanities to be applied in medicine.

## The Humanising Turn in Medicine

Regis Professor of Medicine at Oxford David Weatherall<sup>23</sup> talked of the *inhumanity of medicine* in the in the 1990s, acknowledging that medicine could benefit for subjects outside of the biomedical model. Prior to this, at the turn of the 20<sup>th</sup> century in America some efforts were made to dethrone the dominant Rationalist approach to medicine, which clung rigidly to a biomedical model of clinical practice in isolation of the influence of humanist or socialising principles. This challenge to the status quo was termed a '*Humanising*' movement in medical education<sup>20</sup>. And was largely driven by a sense of *noblesse oblige* of those privileged enough to train as physicians at the time. It is also within this context that the proposition of introducing semiotics into clinical education is framed.

Prior to the modern allusions of a humanising turn in clinical education, which shall be addressed forthwith, it is important to highlight some of its historical antecedents. For example in American debates around curricula reform, tensions between Abraham Flexner's biomedical model of medical education (circa 1910), came into conflict with William Osler's more holistic approach to medicine, who argued that a physician should be "*humane and learned*"<sup>24</sup>. In regard to medicine Osler took the ontological position that "*The practice of medicine is an art based on science*"<sup>3 25</sup>. Osler interestingly also placed emphasis on the Hippocratic corpus, and the humble and gentle manner that it recommend doctors inculcate<sup>25 26</sup>. Consequently, Oslerian reforms have been termed a "*humanizing movement*" in clinical education by Vinten-Johansen and Riska<sup>24</sup>. An entirely appropriate term that persists to this day, and was the basis for later reforms in medical education in the 1960s and 70s America, the proponents of which terming themselves the 'New' Oslerians (ibid).

Although now found in many other institutions with medical schools and teaching hospitals, the first British medical school to instigate a programme of medical humanities was the University of Glasgow in the 1980s (REF, 2014). The University described the rationale for the programme in the following way:

*"The field of medicine has become more complex and morally demanding as it faces the challenges of technological advances, changing social attitudes and financial*

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<sup>3</sup> Quote number 143

*constraints...These challenges require a profession with independent judgment and a willingness to listen to, and communicate humanely with patients. The complex skills required for this can be developed through what have become known as the 'medical humanities', or the application of philosophy and other humanities to medical education."* (Ibid, 2014)

The premise of this argument being that effective clinical judgement requires more than just a technical element, this additional element being something that humanities can teach (Downie and Macnaughton, 2000). It was not until 1993 that the General Medical Council (GMC) of the United Kingdom started to recommend the incorporation of medical humanities modules in its guidance for trainee doctors in its still running guidance - *Tomorrows Doctors*<sup>27</sup>:

*"It is hoped that the student of tomorrow may be drawn towards some...other discipline and that opportunities to study, for example, a language or to undertake a project related to literature, or the history of medicine, may be offered."* (ibid, Para 29)

However these modules, were, and still are what is known as SSUs, Special Study Unit, or SSCs Student Selected Components, SSMs special study modules or something of a similar nomenclature. Which function as an additional course for medical students that offer additional credits but are by no means a core part of the medical curriculum. Similar movements had occurred previously in America, for example in 1988, when Rodgers<sup>28</sup> in conjunction with the New York Academy of Medicine called for a more appropriate mixture of humanities and sciences in medical education<sup>29</sup>. Unsurprisingly, medical humanities SSU's exist in other English speaking countries as well, many of which predate the 1993 official endorsement of them by the GMC, for example Bickel<sup>30</sup> identified that 113 of the 127 medical schools in the USA had programmes of medical ethics. In recent years this figure appears to have decreased as the combined figure for the USA and Canada circa 2003 was only 41 programmes in medical humanities<sup>31</sup>. In a British context, as of 2013 humanities modules are available to medical students in 30 of the UK's 32 medical schools<sup>32</sup>. Although humanities are not a requirement for British medical students they are at least available. Following this Macnaughton<sup>33</sup> has highlighted three different ways in which SSU's are taught in medical schools:

1. Medical SSU

Medical SSUs will address a directly medical topic, but not one that forms part of mainstream clinical teaching

## 2. Ancillary Medical SSU

A non-medical subject that is directly relevant to the practice of medicine, i.e. skills that are required to be a doctor like computer literacy, communication skills, co-production of services training etc.

## 3. Non-Medical SSU

Non-medical subjects such as languages that have no direct relevance to the practice of medicine but may help develop doctors in other educational areas

By 1996, the medical humanities occupied a '*modest spot*' in the special study units courses in medical schools (Calman and Downie, 1996). This foundational work prompted continuing debate about the role of humanities in medical schools in the UK (Downie, 1999) and in other predominantly English speaking countries such as Australia<sup>34 35</sup> and New Zealand (Downie, 1998). The first appraisal of the a medical humanities course was conducted in 2000 by Macnaughton<sup>21</sup>. It found that the volume of work as well as the scope of medical humanities in clinical education was quite broad. For example between January 2000 and December 2008 Ousager and Johannessen<sup>19</sup> found 245 papers on medical humanities in clinical education, although very few of the papers attempted to evaluated the educational benefits of their programmes (ibid).

Outside of the works of Thure von Uexküll the author recognises that the rich body of literature on medical humanities in relation to education can also shed light on the ways in which semiotics can be introduced into medical education. Take for example Shapiro, et al.<sup>22</sup> Appel, et al.<sup>36</sup> Dolev, et al.<sup>37</sup> Boisaubin and Winkler<sup>38</sup> Weller<sup>39</sup> who taught medical students the processes of pattern recognition through the analysis of works of art to improve their observational skills in diagnosis. Following this Macnaughton<sup>33</sup>, p50 argues that teaching philosophy in SSUs "*can teach students to order thoughts, construct an argument and reach a logical conclusion. These skills are essential in diagnosis where the doctor must gather information to support a thesis and go through logical steps to reach a conclusion.*" It is interesting to see the

same rationale being given by both Macnaughton<sup>33</sup> and Shapiro et al.(2006)<sup>4</sup> both of which could function in a socio-semiotic pedagogy.

The publication of *Tomorrow's Doctors* in 1993 by the General Medical Council was one of the pivotal moments for medical humanities in the UK. As it acts as the first exhortation to including non-medical subjects in medical curriculums in a significant amount of time:

*"As medical research advances it will inevitably become increasingly dependent on the ideas and techniques of other disciplines...on the social sciences and philosophy in confronting the wide range of cultural, environmental and ethical issues that will increasingly impinge on the problems of health. It is hoped that the student of tomorrow may be drawn towards some of these other disciplines and that opportunities to study for example a language, or to undertake a project related to literature or the history of medicine, may be offered". (ibid) p.28*

In her characterisation of medical humanities in clinical education, Shapiro, et al.<sup>41</sup> uses the term 'applied humanities' in opposition to a theoretical standpoint, because "such theorizing seems to bear little relationship to day-to-day medical education or clinical practice" (ibid, 194). Practical applications of semiotics in humanities subjects could be used to augment traditional training in diagnosis or clinical reasoning, whilst also and fitting within the remit as set out by the GMC (1993). An example of which would be the use of Peircean abduction, which underpins the diagnostic process<sup>42</sup>.

It is for this reason that the author hypothesises that medical semiotics could be a valuable addition to current medical humanities SSUs. And so it is argued that within the humanising turn in clinical education the resurrection of medical semiotics back into medical school curricula could be performed. Subsequently this literature review poses the following questions: Will the humanising turn in medicine allow the reintroduction of medical semiotics in medical curricula? And if so what lessons can we learn from Thure von Uexküll about it? It is the author's hope that the data in subsequent sections of the paper may illuminate these issues.

## METHODS

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<sup>4</sup> This logic in relation to diagnosis has also been argued for in terms of literature 40. Montgomery Hunter K, Charon R, Coulehan JL. The Study of Literature in Medical Education. *Academic Medicine* 1995;**70**(9):787-94. and for Philosophy by Downie and Macnaughton (1999).



The literature that forms the data set in this paper was collected from several sources during 2015. The primary sources of data were the bibliographies of Thure von Uexküll compiled by Kull and Hoffmeyer<sup>43</sup> and Koehle<sup>44</sup>. Additional papers were located through online literature searches, citation chasing and interaction with expert scholars on Thure von Uexküll.

### **Methodological Constraints**

Whilst the titles of the German language literature of Thure von Uexküll are available to those who wish to translate them, acquiring copies of the works themselves proved challenging. One methodological constraint that arose from this was that some of the journals Thure published in have ceased to exist. Other journals are only accessible in person in German archives, whilst some papers could not be located at all. Other sources for Thure's work although referenced remains vague, rendering their identification difficult, for example his 1959 paper *Umwelt und Vererbung* simply listed its source as *Deutsche Universitätszeitung*, exactly which German University Journal remains unknown. In short the literature offered in this paper remains inchoate and the translation of the literature remains an ongoing process and challenge. In addition, there is also an issue with the nature of attribution of categories. The author has categorised the works of Thure von Uexküll himself, in accordance to his own judgement. Others may quite rightly make different allocations and categories, changing the nature of the data that has been given in Tables 1 and 2.

### **DATA- The works of Thure von Uexküll**

In total 201 academic papers, forewords, book chapters and conference speeches all of which are in German were located. As a contrast to this, 69 English language publications by Thure von Uexküll were identified to highlight the difference in the bodies of work. The date of publication ranged from 1935 until 2008, as some of the works were published posthumously. These publications' titles were translated, and then categorised according to subject area. Table 1 contains the breakdown of the percentage and number of works that fall into each category.

**Table 1 German Language Publications of Thure von Uexküll**

Subject Area	N° Publications	Percent %
Psychosomatic Medicine	90	44.8
Clinical Education	24	11.9
Biomedical Science	24	11.9
Biosemiotics	17	8.5
Philosophy of Science	12	6.0
Medical Semiotics	11	5.5
Medical Philosophy	9	4.5
Medical Sociology	7	3.5
Medical Services	7	3.5
Total	201	100%

The subject areas in table 1 consist of established academic areas such as philosophy of Science, Biosemiotics, Psychosomatic medicine, and Medical Philosophy. But perhaps surprisingly 12 % of the papers are on clinical education, which given the medical training of Thure von Uexküll is not completely unorthodox. This in itself is perhaps not surprising, however if one was to investigate Thure von Uexküll's works that have been written or translated into English, a different pattern emerges. A summation of all the English language works of Thure von Uexküll that have currently been published can be found in Table 2.

**Table 2 English Language Publications of Thure von Uexküll<sup>5</sup>**

Subject Area	N <sup>o</sup> of Publications	Percent %
Psychosomatic Medicine	22	31.9
Biosemiotics	15	21.7
Medical Semiotics	9	13.0
Semiotics (general)	9	13.0
Prefaces and Forewords	5	7.3
Misc.	4	5.8
Philosophy of Science	3	4.4
Medical Philosophy	1	1.5
Medical Sociology	1	1.5
Clinical Education	0	0.00
Biomedical Science	0	0.00
Medical Services	0	0.00
Total	69	100%

Table 2 in comparison to Table 1 shows the clear absence of clinical education literature in Thure von Uexküll's English publications, as well as biomedical science and medical services research. In an effort to map the progression of Thure's work as well as its linguistic difference all of the data in Table 1 is display according to the year that is was produced in Figure 1.

<sup>5</sup> This table has been created based on data generously shared by Professor Kalevi Kull.

FIGURE 1 HERE

## DISCUSSION

In Figure 1, a chronology of Thure von Uexküll's works in German is given by frequency of publication. This figure represents all the papers that Thure von Uexküll wrote, co-wrote, books he edited, conferences speeches that he gave and posthumously published works – hence the timeframe extends past 2004 (the year of his death). If the figure had incorporated his English language work, a different structure would have arisen, but as this paper focuses on his German publications the author has restricted the figure to German language works alone. Figure 1 shows that Thure's early years were populated with works on biomedical science, and the philosophy of science, but dominant throughout his entire career is the presence of psychosomatic medicine (which is furthest to the rear of the figure). The biomedical science that initially formed the basis for Thure's work had significantly diminished by the mid-1960s. This is also the point where we started to see his largest output of clinical education papers. Moving from the mid-1980s up to the late 1990s we can see an increased emphasis on biosemiotic topics as well – See<sup>45-58</sup>. There are perhaps also other subjects of note that one might associate with Thure's work, but he also published papers on medical history<sup>59-64</sup>, the philosophy of medicine<sup>65-71</sup> and non-humanities subjects like medical sociology, the organisational structures of medical services<sup>72-86</sup>, faculty reform and the future of medical education<sup>87-92</sup>. As well as the more obvious areas such as medical semiotics<sup>93-98</sup> some of which also have English translations – See Von Uexküll<sup>14</sup>.

To the author's knowledge clinical education is part of the canon of Thure von Uexküll's work that is yet to be explored in any semiotic context, perhaps owing to it being available solely in German<sup>6</sup>. A full list of all the clinical education papers of Thure von Uexküll is given in Appendix 1. They cover a range of topics, but one of the primary themes is medical regulation – See<sup>100-102</sup>. Medical regulation being inherently connected to medical education, in that the regulatory processes tend to filter back into the preparatory teaching in medical schools. Given that both are

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<sup>6</sup> This should perhaps come as no surprise when one considers the fact that *History, Theory and Ethics in Medicine*, or *Geschichte, Theorie, Ethik der Medizin* (GTE) as it is usually rendered in German, is still a compulsory module in German medical school curricula – See 99. Polianski JJ, Fangerau H. Toward "Harder" Medical Humanities: Moving Beyond the "Two Cultures" Dichotomy. *Academic Medicine* 2012;**87**(1):121-26.

concerned with instilling particular behavioural processes, an effort is made to teach such processes prior to students graduating onto the hospital wards.

### **Structuralist Constraints**

The line of thinking set out in this paper suffers from several deficiencies. Some of which are a consequence of the pre-eminence of economic capital in the field of medical schools due to the devalued nature of social and cultural capital in these institutions<sup>103</sup>. Also the intent of the paper is perhaps overly structuralist in its wish that doctors can be humanised simply by greater exposure to semiotic thought.

Medical education has a clear division between the biomedical scientists and clinical practitioner<sup>104, p62</sup>. It is thought attempts at curricula reform in medicine have failed because these two groups have opposing forms of capital. Essentially the 'hard' science of medicine vs the art of surgery and other medical practices, that do not view each other as legitimate. Hence the introduction of integrative curricula that combines a humanities element runs a risk of failure due to the inherent struggle for dominance in the clinical educational system<sup>105</sup>.

Hypothetically if medical semiotics was introduced into a medical curriculum, it does not follow that we would see its processes replicated in the practice of medical students. The medical habitus<sup>104 106-108</sup> will have to continue to undergo a slow moving change before we will see medical semiotics return to the medical school curricula. As the medical habitus that students develop is a complicated process of socialisation that will require more than non-compulsory modules in semiotics to change it. Some such as Bloom<sup>109</sup> have suggested such reforms in medical education only ever were *panem et circenses* delivered down from the medical hierarchy to occupy idealistic juniors intent on change, in his own words:

*"Medical education's manifest humanistic mission is little more than a screen for the research mission which is the major concern of the institutions social structure."*

p.294

The research mission here referring to the economic benefits generated from research grants, which Bloom argues is the real driving force behind curricula development. If one looks at the demographics of students who successfully enter British medical schools, one can see, as a result of 'widening participation activities'

since the 1970's there has been great increases in the numbers of female, ethnic and minority students as well as older student<sup>110</sup>. However if one looks at the economic profile of medical students, there has been no significant change in the economic backgrounds of the students admitted since the 1970s (ibid, p7). The GMC themselves, in their statistics of registered practitioners do not even list socio-economic data<sup>111</sup> yet categories such as nationality, race, gender etc. are all addressed. This highlights the effective dominance and homeostatic effects of the economic resources in medical education, and illustrates the inherent difficulty in attempting curricula reform. In summation there may have to be significant social changes in British medical culture before we may once more witness semiotics being within the épistème of medical education.

The only saving grace for those of us, who wish to see a humanising turn in medical education, is the structure of British medical schools themselves. An explanation of the variety of approaches to medical education in the UK is given by Brosnan<sup>104</sup>, p63:

*"In the UK...the medical schools with the highest research profiles have tended to retain largely traditional medical curricula, while the newest medical schools, which generally have lower research income and prestige, typically claim to have 'innovative' curricula which integrate science with clinical practice. This may represent attempts on the part of the new schools to symbolically differentiate themselves from the dominant players in the field, rather than to attempt to compete on the same terms"*

The best hope is perhaps the newer British medical schools whose curricula position in the medical field is not entrenched solely in reductionist biomedical science<sup>7</sup>. However the author does recognise the overall structuralist issue with his work.

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<sup>7</sup> Interestingly some studies have suggested that students with a mixture of science and humanities subjects upon entering medical school may perform better – see 112. Neame RLB, Powis DA, Bristow T. Should medical students be selected only from recent school-leavers who have studied science? *Medical Education* 1992;**26**(6):433-40., 113. Lipton A, Huxham GJ, Hamilton D. Predictors of success in a cohort of medical students. *Ibid.*1984;**18**(4):203-10. & 114. Warren KS. The humanities in medical education. *Annals of internal medicine* 1984;**101**(5):697-701.

## International Generalisation

The social implications given thus far are relevant to the culture of medical education as it exists in the United Kingdom. Other English speaking countries, such as the United States for example whose different economic and cultural approach to medical education would ultimately have contrasting attitudes to the re-introduction of semiotics into medicine. Critically from an American perspective one must account for the influence of the pharmaceutical industry upon medical education. For example as Lo and Field <sup>115</sup> highlighted the Association of American Medical Colleges (AAMC)<sup>116</sup> and Members of the U.S. Congress<sup>117</sup> indicated that the pharmaceutical industry has the potential to negatively alter trainee doctors concepts of autonomy, objectivity, and altruism, The concerns is related primarily to the private companies funding students places in medical schools, which is part of a wider cultural milieu of private finance in the American medical sector. In a paper critiquing the changes in medical education 100 years after Flexner 's reforms Cooke , et al. <sup>118</sup> suggested that for America circa 2006:

*“The need for a fundamental redesign of the content of medical training is clear. In some instances, the road that needs to be taken is also clear — for example, more emphasis should be placed on the social, economic, and political aspects of health care delivery”* p.1342

But yet he was also conceded that *“curricular reform is never simple or easy,... The challenge is not defining the appropriate content but rather incorporating it into the curriculum in a manner that emphasizes its importance relative to the traditional biomedical content and then finding and preparing faculty to teach this revised curriculum”* (ibid, p.1343). Extrapolating from Cooke et al it seems any adoption of medical semiotics in an American curriculum would require it to *emphasize its importance relative to the traditional biomedical content*. A similar position to Mascia and Cicchetti <sup>119</sup> who suggested that evidence based medicine needs to have a *heavy emphasis* in comparison to a physician relying on their thoughts or educational experience. To an extent this would void the intent outlined in this paper, to offer a counter-balance to the biomedical model, and not to use it as yardstick by which other approaches to medical education can be measured.



This leads the author to suggest that the application of the works of Thure von Uexküll in medical education may not be possible in some states or particular areas of medicine which have differing socio-economic structures in relation to how and why medicine is taught. However it is important not to suggest that reforms of the biomedical model in American medical education have not occurred. Take for example the biopsychosocial model created by Engel in the late 1970s, which conceptualised both health as being constituted by a variety of contributing factors including family relationships, genetics, behaviour and lifestyle factors<sup>120</sup>. Whilst Engel himself advocated the teaching of this approach in medical schools<sup>121 122</sup> it has also gained popularity in other areas of medicine, primarily in areas that have a psychological or psychiatric component<sup>123</sup>, such as in family medicine and with paediatricians<sup>124</sup>. Family Medicine in particular has seen an extensive use of this model since the early 1980s<sup>125</sup>.

Doherty, et al.<sup>126</sup> has highlighted that the adoption of Engel's model in family medicine is on a spectrum, with some using it leaning towards a more biological interpretation, and others to a more psychological interpretation. Doherty also highlighted that it was in the 1980s that students of family medicine would have come to be exposed to the ideas of the biopsychosocial model whilst on residency (ibid). As has been touched already though the ability to apply such models can be limited by external factors such as the time that a physician gets to examine a patient (Mauksch<sup>127</sup> estimates 15 minutes on average) does not given a doctor sufficient time to use the model to its full extent<sup>128</sup>.

Whilst this progress is of courses welcome, the areas of medicine that one could consider already *humanised* through the use of the Engel's Biopsychosocial model or other approaches such as the Balint Groups like family medicine, psychiatry, psychosomatics etc, do not cover the entire scope of the profession. But as noted, the potential application of such approaches will not probably be possible in all cultural systems or all areas of medicine. However it does seem that the works of Thure von Uexküll should be considered alongside these other approaches as a potential humanising method in medical education.

## CONCLUSION

Within Thure von Uexküll's numerous works there is a stand of literature devoted to clinical education, all of which is in German, and so remains to be translated and introduced to the English speaking world of medical practice. The work of Thure von Uexküll and other medical semioticians could help medical students improve their skills in abductive reasoning as applied in diagnosis, and their ability to incorporate polysemous signification into their decision making processes. There is a continuing need for humanities subjects to be part of clinical education, and the author feels that semiotics can be part of the continuing humanizing process within medicine.

In line with MacNaughton <sup>129</sup>, p121 the author believes that "*If the profession [medicine] continues to search within itself for a definition it will fail.*" Similar insular warnings about the future of semiotics have been given by Sebeok <sup>130</sup>, p353 "*Semiotics is too important to be left in the hands of the 'semiotician ordinaire'*" a sentiment previously indicated by Sless <sup>131</sup>. The introduction of medical semiotics curricula would be advantageous for both subjects. More importantly this multidisciplinary arrangement in clinical education would benefit medical students and ultimately their patients.

## ACKNOWLEDGMENTS

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## FIGURE LEGENDS:

Table 1 German Language Publications of Thure von Uexküll

Table 2 English Language Publications of Thure von Uexküll

Figure 1 Frequency of Thure von Uexküll's German Language Papers by Year

## REFERENCES

1. Kleinpaul R. Sprache ohne Worte. Idee einer allgemeinen Wissenschaft der Sprache. Das Leben der Sprache und ihre Weltstellung. Leipzig: Wilhelm, Friedrich., 1893.
2. Manetti G. *Theories of the Sign in Classical Antiquity*. Indiana Indiana University Press, 1993.
3. Coulter HL. Empiricism vs. Rationalism in Medicine. *Journal of Orthomolecular Medicine* 1994;**9**(3):159.
4. Engel GL. The need for a new medical model: a challenge for biomedicine. *Science* 1977;**196**(4286):129-36.
5. Petrilli S, Ponzio A. *Semiotics Unbounded: Interpretive Routes through the Open Network of Signs*. Toronto University of Toronto Press, 2005.
6. Peirce CS. Questions Concerning Certain Faculties Claimed for Man. *Journal of Speculative Philosophy* in *CP* 5264-5317, 1868:103-14.
7. Peirce CS. Some Consequences of Four Incapacities *Journal of Speculative Philosophy* in *CP* 5317-5357, 1868:193-208.
8. Stables A. Peirce and Rationalism: Is Peirce a Fully Semiotic Philosopher? *Journal of Philosophy of Education* 2014;**48**(4):591-603.
9. Feodorovich FN, Hippius A. *Semiotik und Diagnostik der Kinderkrankheiten*. Stuttgart: Verlag von Ferdinand Enke, 1892.
10. Hufeland CW. Ueber den Werth und die Bedeutung der Semiotik *Journal der Practischen Heilkunde* 1823;**8**(128):3-9.
11. Becker FW. Zur Physiologie und Semiotik der Herzthätigkeit *Med Ztg v Ver f Helik* 1832;**4**(1/15):pp.63-68.
12. Hess V. Medical semiotics in the 18th century: A theory of practice? *Theoretical Medicine and Bioethics* 1998;**19**(3):203-13.
13. Tredinnick-Rowe J. ¿Qué es la Semiótica Médica? *Revista Catedra Villarreal* 2016;**4**(1).
14. Von Uexküll T. Medicine and semiotics. *Semiotica* 1986;**61**(3/4):201-17.
15. Von Uexküll T. Semiotics and medicine. *Semiotica* 1982;**38**(3-4):205.
16. von Uexküll T. *Lehrbuch der psychosomatischen Medizin*. Munich: Urban & Schwarzenberg, 1979.
17. Coble P. What the Humanities Are For: A Semiotic Perspective. *American Journal of Semiotics* 2014;**30**(3/4):205-28.
18. Hudson Jones A, Carson RA. Medical Humanities at the University of Texas Medical Branch at Galveston. *Academic Medicine* 2003;**78**(10):1006-09.
19. Ousager J, Johannessen H. Humanities in undergraduate medical education: a literature review. *Academic Medicine* 2010;**85**(6):988-98.
20. Kimball CP. Medical education as a humanizing process. *Academic Medicine* 1973;**48**(1):71-7.
21. Macnaughton J. The humanities in medical education: context, outcomes and structures. *Medical Humanities* 2000;**26**(1):23-30.
22. Shapiro J, Rucker L, Beck J. Training the clinical eye and mind: using the arts to develop medical students' observational and pattern recognition skills. *Medical education* 2006;**40**(3):263-68.
23. Weatherall DJ. The inhumanity of medicine. *BMJ : British Medical Journal* 1994;**309**(6970):1671-72.
24. Vinten-Johansen P, Riska E. New Oslerians and Real Flexnerians: The Response to Threatened Professional Autonomy. *International Journal of Health Services* 1991;**21**(1):75-108.
25. Silverman M, Murrar TJ, Bryan CS. *The Quotable Osler*. Philadelphia: American College of Physicians, 2003.
26. Silverman BD. Physician behavior and bedside manners: the influence of William Osler and The Johns Hopkins School of Medicine. *Proceedings (Baylor University Medical Center)* 2012;**25**(1):58-61.

27. GMC. *Tomorrow's doctors: Recommendations on undergraduate medical education*. London: General Medical Council. Education Committee, 1993.
28. Clinical education and the doctor of tomorrow. Proceedings of The Josiah Macy Jr Foundation National Seminar on Medical Education 1988; New York. New York Academy of Medicine.
29. Puckett ACJ, Graham DG, Pounds LA, et al. The Duke University program for integrating ethics and human values into medical education. *Academic Medicine* 1989;**64**(5):231-5.
30. Bickel J. Human values teaching programs in the clinical education of medical students. *Academic Medicine* 1987;**62**(5):369-78.
31. Dittrich LR, Farmakidis AL. The Humanities and Medicine: Reports of 41 U.S., Canadian, and International Programs. *Academic Medicine* 2003;**78**:951-52.
32. REF. Establishing the Medical Humanities movement in the UK and influencing the education of healthcare professionals: Research Excellence Framework, 2014.
33. Macnaughton J. Special study modules: an opportunity not to be missed. *Medical Education* 1997;**31**(1):49-51.
34. Moore AR. Medical humanities—A new medical adventure. *New England Journal of Medicine* 1976;**295**(26):1479-80.
35. Downie R, Macnaughton J. Should medical students read Plato? *Med J Aust* 1999;**170**(3):125-27.
36. Appel MH, Stegeman C, Mark R, et al. Visual arts training to enhance observational skills of medical students. *Res Med Educ* 1984;**23**:85-90.
37. Dolev JC, Friedlaender L, Braverman IM. Use of fine art to enhance visual diagnostic skills. *JAMA* 2001;**286**(9):1020-21.
38. Boisauvin EV, Winkler MG. Seeing Patients and Life Contexts: The Visual Arts in Medical Education. *The American Journal of the Medical Sciences* 2000;**319**(5):292-96.
39. Weller K. Visualising the body in art and medicine: a visual art course for medical students at King's College Hospital in 1999. *Complementary Therapies in Nursing and Midwifery* 2002;**8**(4):211-16.
40. Montgomery Hunter K, Charon R, Coulehan JL. The Study of Literature in Medical Education. *Academic Medicine* 1995;**70**(9):787-94.
41. Shapiro J, Coulehan J, Wear D, et al. Medical Humanities and Their Discontents: Definitions, Critiques, and Implications. *Academic Medicine* 2009;**84**(2):192-98.
42. Stanley DE, Campos DG. The Logic of Medical Diagnosis. *Perspectives in Biology and Medicine* 2013;**56**(2):300-15.
43. Kull K, Hoffmeyer J. Thure von Uexküll 1908–2004. *Sign Systems Studies* 2005;**33**(2):487-94.
44. Koehle K. Für Thure von Uexküll zum 95. Geburtstag Online: Karl Koehle; 2003 [Available from: <http://www.karl-koehle.de/archiv/uexkuell/publikation.html>].
45. von Uexküll T. Umwelt und Vererbung. *Deutsche Universitätszeitung* 1959;**14**:455-60.
46. von Uexküll T, Kriszat G. Die Umweltforschung als subjekt-und objektumgreifende Naturforschung. In: von Uexküll T, ed. *Streifzüge durch die Umwelten von Tieren und Menschen*. Frankfurt: Fischer, 1970.
47. von Uexküll T. Die Zeichenlehre Jakob von Uexkülls und die Wissenschaft vom Menschen. *Merkur* 1979;**33**:621-35.
48. von Uexküll T. Die Zeichenlehre Jakob von Uexkülls. *Zeitschrift für Semiotik* 1979;**1**:37-47.
49. von Uexküll T. Plädoyer für eine sinnvolle Biologie. Die Bedeutung der Lehre Jakob von Uexkülls für die Wissenschaften vom Menschen. In: von Uexküll T, ed. *Jakob von Uexküll Kompositionslehre der Natur Biologie als undogmatische Wissenschaft Ausgewählte Schriften*. Frankfurt am Main: Ullstein GmbH, 1980:17-85.
50. von Uexküll T. Foreword. In: von Uexküll T, ed. *Jakob von Uexküll Kompositionslehre der Natur Biologie als undogmatische Wissenschaft Ausgewählte Schriften*. Frankfurt am Main: Ullstein GmbH, 1980.

51. von Uexküll T. Die Zeichenlehre Jakob von Uexkülls. In: Krampen M, ed. Die Welt als Zeichen: Klassiker der modernen Semiotik Berlin: Severin und Siedler, 1981:233-79.
52. von Uexküll T. Gestaltkreis und Situationskreis. Viktor von Weizsäcker zum 100 Geburtstag: Springer, 1987:126-31.
53. von Uexküll T. Die Wissenschaft von dem Lebendigen. Gedanken zu der Frage nach dem "Inneren der Natur". In: Berlinger R, ed. Agora: Zu Ehren von Rudolph Berlinger : Perspektiven der Philosophie Neues Jahrbuch. Würzburg: Rodopi 1987:451-61.
54. von Uexküll T. Semiotik und Naturwissenschaft, das Problem des Referens. Gedanken zur Grundlegung einer Biosemiotik. In: Claussen R, Oehler K, Daube-Schackat R, eds. Gedankenzeichen Festschrift Für Klaus Oehler Zum 60 Geburtstag. Tübingen: Stauffenburg Verlag,, 1988:225–31.
55. von Uexküll T. Biosemiotik. In: Titzmann M, ed. Zeichen (theorie) in der Praxis 6 Internationaler Kongreß der Deutschen Gesellschaft für Semiotik. Passau, Bavaria.: Wissenschaftsverlag Rothe, 1993.
56. von Uexküll T, Geigges W, Herrmann JM. Endosemiose. In: Posner R, Robering K, Sebeok TA, eds. Semiotik, ein Handbuch zu den zeichentheoretischen Grundlagen von Natur und Kultur. Berlin: Walter de Gruyter, 1997:464 - 87.
57. von Uexküll T. Biosemiose In: Posner R, Robering K, Sebeok TA, eds. Semiotik, ein Handbuch zu den zeichentheoretischen Grundlagen von Natur und Kultur. Berlin: Walter de Gruyter, 1997:447-56.
58. von Uexküll T. Jakob von Uexkülls Umweltelehr. In: Posner R, Robering K, Sebeok TA, eds. Semiotik, ein Handbuch zu den zeichentheoretischen Grundlagen von Natur und Kultur. Berlin: Walter de Gruyter, 1998:2183 - 90.
59. von Uexküll T. Die Physiologie des Johannes Müllers und die moderne Medizin. *Ärztl Wschr* 1958;**13**:613-18.
60. von Uexküll T. 40 Jahre psychosomatische Medizin. Ein geschichtlicher Rückblick. *Munch Med Wochenschr* 1977;**119**:795-800.
61. von Uexküll T. Die Geschichte der psychosomatischen Medizin. *Euromed* 1978;**18**:410-22.
62. von Uexküll T. Geschichte der deutschen Psychosomatik: Philosophische und historische Wurzeln. *Psychotherapie, Psychosomatik, medizinische Psychologie* 1986;**36**(1):18-24.
63. von Uexküll T. Zur Geschichte der Psychosomatik. In: Fervers-Schorre B, Poettgen H, Stauber M, eds. Psychosomatische Probleme in der Gynäkologie und Geburtshilfe. Berlin: Springer, 1986:12-21.
64. von Uexküll T. Die Entstehung der psychosomatischen Medizin aus der Geschichte des Leib-Seele-Dualismus. *Med Klin* 1988;**83**:37-39.
65. Franck E, Heubner W, von Uexküll T. Der Arzt an Deutschlands Schicksalswende. *Ärztl Wschr* 1946;**1**:30-32.
66. von Uexküll J, von Uexküll T. Der Sinn des Lebens. Gedanken über die Aufgaben der Biologie, mitgeteilt in einer Interpretation der zu Bonn 1824 gehaltenen Vorlesung des Johannes Müller: Von dem Bedürfnis der Physiologie nach einer philosophischen Naturbetrachtung 1947.
67. von Uexküll T. Krise der Humanität–Gedanken zum Nürnberger Ärzteprozess. *Die Zeit* 1947 13th Feb 1947.
68. von Uexküll T, Grassi E. Über den Begriff der Materie. *Merkur* 1951;**5**:622-29.
69. von Uexküll T. Gedanken über die Wirkungsweise eines Gesprächs. *Rhetorik* 1987;**6**:115-27.
70. von Uexküll T. Die Bedeutung der Theoriebildung in der Psychosomatik. *Psychotherapy, Psychosomatik, Medizinische Psychologie* 1989;**39**:103-05.
71. von Uexküll T. Freud, die Psychoanalyse und das psychosomatische Problem. *Psyche* 1990;**44**(5):445-58.
72. von Uexküll T. Über das Menschenbild in der heutigen Medizin. *Studium Generale* 1953;**6**:471 - 80.

73. von Uexküll T. Was Kann eine Spezialdisziplin „Soziologische Medizin“ für eine Allgemeine Medizin Leisten? In: König R, Tönnemann M, eds. Probleme der Medizin-Soziologie: VS Verlag für Sozialwissenschaften, 1958:58-79.
74. von Uexküll T. Die Entdeckung des Menschen in der Medizin. In: Unknown, ed. Der Wiederentdeckte Mensch. München Isar verlag, 1958:24-42.
75. von Uexküll T. Die Berufstätigkeit der Frau in psychosomatischer Sicht. Ärztl Mitteilungen 1960;**45**:1201-07.
76. von Uexküll T. Die häusliche Pflege krebskranker Patienten. . Therapie der Gegenwart 1960;**99**:295-13.
77. von Uexküll T. Aufgaben einer soziologischen Medizin in der Heilkunde. Huisarts en Wetenschap 1961;**4**:315-23.
78. von Uexküll T. Krankheit und soziale Situation. SPD: Bonn, 1965.
79. Erdmann H, Overath H, Adam W, et al. Organisationsprobleme der ärztlichen Krankenversorgung. Dtsch Ärzteblatt 1974;**71**: 3421-26.
80. von Uexküll T. Organisationsformen und Organisationsprobleme der psychosomatischen Medizin. Wiener klinische Wochenschrift 1977;**89**:7-10.
81. von Uexküll T. Die Chefarztvisite. In: Köhle K, Böck D, Grauhan A, eds. Die internistische psychosomatische Krankenstation Ein Werkstattbericht. Basel: Rocom, 1977:47-59.
82. von Uexküll T. Lebensgeschichte und Krankheit. In: Maurer F, ed. Lebensgeschichte und Identität: Beiträge zu einer biographischen Anthropologie. Frankfurt am Main: Fischer, 1981:150-67.
83. von Uexküll T. Sprechen und Sprachformen in der Medizin. Patientenbezogene Medizin 1982;**5**:21-34.
84. von Uexküll T. Der Arzt als Scharfrichter, die Klinik eine Folterkammer. Ärztl Praxis 1986;**38**:3094-96.
85. von Uexküll T. Medizin und Soziologie - Interdisziplinarität als Tranquilizer oder als Problem. In: Dieckmann W, ed. Medizinsoziologie in der Bundesrepublik Deutschland - eine Zwischenbilanz. Berlin: Express Edition, 1987: 9-22.
86. Wirsching M, Huber E, von Uexküll T. Die Zukunft gestalten. Strukturen eines sozialen Gesundheitssystems. In: Kröger F, Hendrichke A, McDaniel SH, eds. Familie, System und Gesundheit Systemische Konzepte für ein soziales Gesundheitswesen Heidelberg: Carl-Auer-Systeme Verlag 2000:297-330.
87. Boening H, Cremer HD, Rotter W, et al. Bemerkungen zur Denkschrift der Fachgruppe Medizin und zur Reform des Medizinstudiums im allgemeinen. Fortschr Med 1959;**77**:379-80.
88. von Uexküll T. Studienreform und Fakultätsreform. Ärztl Mitteilungen 1961;**46**:2127-31.
89. von Uexküll T. Eine moderne medizinische Fakultät im Rahmen einer technischen Hochschule. . University of Aachen: Lecture, 1965.
90. von Uexküll T. Die Zukunft der medizinischen Poliklinik. Med Klin 1966;**61**:688-92.
91. von Uexküll T. Reform des Medizinunterrichts in der Bundesrepublik Deutschland. Hoffnung oder Utopie? . Med Klin 1967;**62**:230-34.
92. von Uexküll T. Reform des Medizinstudiums. . Therapiewoche 1970;**20**(5):184-92.
93. von Uexküll T. Körperwelt: Grenze und Kommunikation. In: Brüll EJ, ed. Eranos Jahrbuch 39 Leiden-köln Brill, 1970:301-21.
94. von Uexküll T. Autopoietisches oder Autokinetisches System. In: Hejl PM, Köch WK, Roth G, eds. Wahrnehmung und Kommunikation. Frankfurt am Main: Peter Lang, , 1978:141-49.
95. von Uexküll T. Historische Überlegung zu dem Problem einer Medizin-Semiotik. Zeitschrift für Semiotik 1984;**6**(1-2):53-58.
96. von Uexküll T. Semiotik und Medizin. Zeitschrift für Semiotik 1984;**6**:1-4.
97. von Uexküll T. Symptome als Zeichen für Zustände in lebende Systemen Zeitschrift für Semiotik 1984;**6**(1-2):27-36.

98. von Uexküll T. Das Placebo-Phänomen in semiotischer Sicht. In: Saladin P, ed. "Medizin" für die Medizin: Arzt und Ärztin zwischen Wissenschaft und Praxis Festschrift für Hannes G Pauli. Basel: Helbing & Lichtenhahn, 1989.
99. Polianski IJ, Fangerau H. Toward "Harder" Medical Humanities: Moving Beyond the "Two Cultures" Dichotomy. *Academic Medicine* 2012;**87**(1):121-26.
100. von Uexküll T. Der Begriff der „Regulation“ und seine Bedeutung für eine anthropologische Medizin. *Psyche* 1952;**6**(7):425-42.
101. Ein Beitrag zur Pathologie und Klinik der Bereitstellungsregulationen. Neunundfünfzigster Kongress; 1953. Springer.
102. von Uexküll T. *Beitrag zur Diskussion über den Entwurf einer Approbationsordnung im Rahmen der 5. Delegiertenversammlung der Bezirksärztekammer Nordwürttemberg am 22 November 1969*. Baden-Württemberg Ärztebl. , 1970.
103. Bourdieu P. *Homo Academicus*. Paris: Les Édition de Minuit, 1984.
104. Brosnan C. Pierre Bourdieu and the theory of medical education. In: Brosnan C, Turner BS, eds. *Handbook of the Sociology of Medical Education*. Abingdon, OXON: Routledge, 2009:51-68.
105. Bonner TN. *Becoming a Physician: Medical Education in Britain, France, Germany, and the United States, 1750-1945*. Oxford, UK: Oxford University Press, 1995.
106. Luke H. *Medical Education and Sociology of Medical Habitus: "It's not about the Stethoscope!"* Dordrecht, : Kluwer Academic Publishing, 2003.
107. Sinclair S, Toulis N. *Making Doctors: An Institutional Apprenticeship*. Berg Publishers: Oxford, 1997.
108. Lempp H. Medical School Culture. In: Brosnan C, Turner BS, eds. *Handbook of the Sociology of Medical Education*. Abingdon, OXON.: Routledge, 2012:71-88.
109. Bloom SW. Structure and Ideology in Medical Education: An Analysis of Resistance to Change. *Journal of Health and Social Behavior* 1988;**29**(4):294-306.
110. BMA. Equality and diversity in UK medical schools. London: British Medical Association 2009.
111. GMC. List of Registered Medical Practitioners - statistics: GMC; 2015 [updated 07/12/15]. Available from: [http://www.gmc-uk.org/doctors/register/search\\_stats.asp](http://www.gmc-uk.org/doctors/register/search_stats.asp).
112. Neame RLB, Powis DA, Bristow T. Should medical students be selected only from recent school-leavers who have studied science? *Medical Education* 1992;**26**(6):433-40.
113. Lipton A, Huxham GJ, Hamilton D. Predictors of success in a cohort of medical students. *Medical Education* 1984;**18**(4):203-10.
114. Warren KS. The humanities in medical education. *Annals of internal medicine* 1984;**101**(5):697-701.
115. Lo B, Field MJ. *Conflict of Interest in Medical Research, Education, and Practice*. Washington, DC: National Academy Press, 2009.
116. Association of American Medical Colleges. *Industry Funding of Medical Education*. Washington, DC: Association of American Medical Colleges 2008.
117. U.S. Senate. *Use of Educational Grants by Pharmaceutical Manufacturers*. In: Committee F, ed. Washington, DC: U.S. Government Printing Office 2007.
118. Cooke M, Irby DM, Sullivan W, et al. American Medical Education 100 Years after the Flexner Report. *New England Journal of Medicine* 2006;**355**(13):1339-44.
119. Mascia D, Cicchetti A. Physician social capital and the reported adoption of evidence-based medicine: Exploring the role of structural holes. *Social Science & Medicine* 2011;**72**(5):798-805.
120. Suls J, Rothman A. Evolution of the Biopsychosocial Model: Prospects and Challenges for Health Psychology. *Health Psychology* 2004;**23**(2):119-25.
121. Engel GL. Must We Precipitate a Crisis in Medical Education to Solve the Crisis in Health Care? *Annals of Internal Medicine* 1972;**76**(3):487-90.
122. Engel GL. A response from George Engel to Joseph Herman. *Families, Systems, & Health* 2005;**23**(4):377-78.

123. Álvarez AS, Pagani M, Meucci P. The Clinical Application of the Biopsychosocial Model in Mental Health: A Research Critique. *American Journal of Physical Medicine & Rehabilitation* 2012;**91**(13):173-80.
124. Engel GL. The Biopsychosocial Model and Medical Education. *New England Journal of Medicine* 1982;**306**(13):802-05.
125. Pereira MG, Smith TE. Evolution of the biopsychosocial model in the practice of Family Therapy. *International Journal of Clinical and Health Psychology* 2006;**6**(2):455-67.
126. Doherty WJ, Baird MA, Becker LA. Family Medicine and the Biopsychosocial Model: the road towards integration. In: Doherty WJ, Christianson CE, Sussman MB, eds. *Family Medicine: The Maturing of a Discipline*. New York: Haworth Press, 1987:51-69.
127. Mauksch L. But first, training in biopsychosocial care: A commentary on "The biopsychosocial model is shrink wrapped, on the shelf, ready to be used, but waiting for a new process of care.". *Families, Systems, & Health* 2005;**23**(4):448-49.
128. Hepworth J, Cushman RA. "Biopsychosocial"--Essential But Not Sufficient. *Families, Systems, & Health* 2005;**23**(4):406-09.
129. MacNaughton J. Core values: doctor or everyman? *BMJ : British Medical Journal* 1996;**313**(7049):120-21.
130. Sebeok TA. Semiotics in The United States. In: Sebeok TA, ed. *The Semiotic Web* 1989. Berlin: Mouton de Gruyter, 1990:275 - 399.
131. Sless D. *In Search of Semiotics*. Michigan: Barnes & Noble Imports, 1986.



## Appendix 1 German Language Clinical Education papers of Thure von Uexküll

German Title with Translations
Uexküll, Th. von: Der Begriff der "Regulation" und seine Bedeutung für eine anthropologische Medizin [ <i>The term "regulation" and its importance for an anthropological medicine</i> ]. <i>Psyche</i> 6 (1952/53), 425-442.
Uexküll, Th. von: Ein Beitrag zur Pathologie und Klinik der Bereitstellungsregulationen [ <i>A contribution to the regulation of Pathology and Clinical deployment</i> ]. <i>Verh. Dt. Ges. inn. Med.</i> 59 (1953), 104-107.
Uexküll, Th. von: Über die heutige Stellung der inneren Medizin in den vereinigten Staaten [ <i>About the current position of internal medicine in the United States</i> ]. <i>Verh. dt. Ges. inn. Med.</i> 60 (1954), 205-208.
Boening, H., H.D. Cremer, W. Rotter, Th. von Uexküll: Bemerkungen zur Denkschrift der Fachgruppe Medizin und zur Reform des Medizinstudiums im allgemeinen [ <i>Remarks on the memorandum of the Section for Medicine and the reform of medical education in general</i> ]. <i>Fortschr. Med.</i> 77 (1959), 379-380.
Uexküll, Th. von: Studienreform und Fakultätsreform [ <i>Academic reform and Faculty reform</i> ]. <i>Ärztl. Mitteil.</i> 46 (1961), 2127-2131.
Uexküll, Th. von: Heinrich Boening. Ansprache anlässlich der Gedenkfeier der Medizinischen Fakultät am 7. Juni 1961 [ <i>Heinrich Boening. Speech on the occasion of the commemoration of the Faculty of Medicine on June 7, 1961</i> ]. <i>Nachrichten der Gießener Hochschulgesellschaft</i> 30 (1961), 7-8.
Uexküll, Th. von: Die personelle Struktur der klinischen Fächer in den neuen Hochschulen [ <i>The staff structure of clinical subjects in the new universities</i> ], S 21-33. Schwartz, Göttingen 1962.
Uexküll, Th. von: Eine moderne medizinische Fakultät im Rahmen einer technischen Hochschule [ <i>A modern medical faculty as part of a technical college</i> ]. Festvortrag, Aachen 1965.
Uexküll, Th. von: Die Zukunft der medizinischen Poliklinik [ <i>The future of the Medical Poly Clinic</i> ]. <i>Med. Klein.</i> 61 (1966), 688-692.
Uexküll, Th. von: Reform des Medizinunterrichts in der Bundesrepublik Deutschland. Hoffnung oder Utopie? [ <i>Reform of medical education in the Federal Republic of Germany. Hope or Utopia?</i> ] <i>Med. Klin.</i> 62 (1967), 230-234.
Gabelmann, W., Th. von Uexküll: Was ist ein "teaching hospital"? [ <i>What is a "teaching hospital"?</i> ] <i>Das Krankenhaus</i> 59 (1967), 413-416.
von Uexküll, Thure, ed. Probleme des Medizinunterrichts: Bericht über die Arbeitsgruppe Hochschuldidaktik, Untergruppe Medizin am 20. Oktober 1967 in Ulm [ <i>Problems of medical education. Report of the Didactics in Higher Education working group, Medicine subgroup on October 20<sup>th</sup> 1967 in Ulm</i> ]. Urban & Schwarzenburg, 1967
Gabelmann, W., Th. von Uexküll: Akademische Lehrkrankenhäuser im Dienste der medizinischen Ausbildung [ <i>Academic teaching hospitals in the service of medical</i> ]. <i>Öff. Gesundh.-Wes.</i> 30 (1968), 191-195 (textidentisch mit: Was ist ein "teaching hospital"?, 1967).
Uexküll, Th. von: Beitrag zur Diskussion über den Entwurf einer Approbationsordnung im Rahmen der 5. Delegiertenversammlung der Bezirksärztekammer Nordwürttemberg am 22. November 1969 [ <i>Contribution to the discussion on the draft licensing regulations at the 5th Assembly of Delegates of the District Medical association building on 22 November 1969</i> ]. <i>November 1969. Ärztbl. Baden-Württemberg</i> 25 (1970), 16-18.
Uexküll, Th. von: Reform des Medizinstudiums [ <i>Medical Studies Reform</i> ]. <i>Therapiewoche</i> 20 (1970), 184-192.

Uexküll, Th. von: Das Problem der Ausbildung zum Arzt in der modernen Welt [ <i>The problem of medical training in the modern world</i> ]. <i>Ärztl. Mitteil.</i> 68 (1971), 709-714.
Auernhammer, W., U. Egle, J. M. Hermann, K. Köhle, R. Metzger, G. Paar, M. Rassek, N. Schäfer, O. Schairer, B. Schlecker, Th. Schmidt, O. Schonecke, W. Schüffel, K. H. Schultheis, C. Simons, Th. von Uexküll: Praktische Psychosomatik als integrierende Unterrichtsveranstaltung im Rahmen der Approbationsordnung [ <i>Practical Psychosomatics as integrating education event in context of Licensing Regulations</i> ]. <i>DÄ-Ärztl. Mitt.</i> 74 (1977), 813-818.
Uexküll, Th. von: Confused Consent: Organische Krankheit, Antwort des Internisten, Verlorenheit des Kranken [ <i>Confused Consent: Organic disease, interns response, patient forlornness</i> ]. <i>Schweiz. Psychosom. Med.</i> II (1982), 24-34.
Uexküll, Th. von: Was weiß die Medizin vom Menschen? [ <i>What does the medicine man know?</i> ] In: H. Rösner: <i>Der ganze Mensch</i> , S. 146-168. dtv, München 1986.