Human Movement as an academic field of study is discussed in the context of the emergence of faculties/departments of Human Movement Science in other countries (particularly Canada and The Netherlands). The Trondheim Model for the development of Human Movement Science put forward here builds on this knowledge to present a structure that might be particularly viable in the Norwegian situation. Essentially a multidisciplinary, fundamental, academic study of human movement is proposed at University level, linked formally or informally to a number of applied satellite institutions (within or outside the University structure) concerned with the influencing of human movement (e.g. Medicine – particularly child development, rehabilitation, physiotherapy and ergotherapy; sport; ergonomics; physical education; dance and the performing arts). A working relation between the central institution (Department/Faculty) and the satellite fields would be established – particularly – on the research side – to foster mutual interests.

The study of human movement, as of any other field of enquiry, can be carried out for purely intrinsic reasons in which consideration of its relation and application to the professional sub-fields concerned with the influencing of human movement is never on the order. Such a standpoint would be very sterile. Over the past twenty years there has been an escalation in the scientific literature of findings in which human movement has been the dependent or independent variable. This is as true for a large number of scientific journals, from diverse discipline stand-points, as it is for the more specialist multidisciplinary international journals like ‘Human Movement Science’ - addressed entirely to the phenomenon of human movement. In this time period, the difficulties involved in establishing Human Movement as a recognized field of study in universities have been largely overcome although there are still a number of countries which have yet to follow the initiative. Norway being one of those countries has provided the incentive for this article. The use of
"Trondheim" to preface the Model is a recognition that the Department of Idrett in at the University of Trondheim has, for some time, been feeling its way in the direction of Human Movement Science but has been doing so in an ad hoc rather than a systematic manner.

The biomechanist Nigg (1993) has recently been prophetic about the future development of Human Movement Science although it has to be said that his statement, in this respect, is rather belated given that in some parts of the world a similar initiative was taken more than two decades ago:

The discipline of sports science should or will expand to a broader discipline of movement science... Movement science will be one of the most important and most recognized science fields in the twenty-first century...The future discipline of movement science has a unique opportunity to become an important contributor to the well-being of mankind.

Furthermore, this statement tends to confuse the relation between the generic field of Human Movement Science and one of its applied sub-fields -Sport i.e., it puts the cart before the horse! Having said this, it has to be agreed that some departments of Human Movement Science have developed in this way, but in so doing their development has, generally, been constrained by their history.

It is this important distinction that lies at the heart of the Trondheim Model i.e., the establishment of the Mother-field - Human Movement Science - and the reinforcement of its links and working relations with its applied sub-fields.

What has been seen in the last two decades is that relatively isolated pockets of knowledge about human movement have begun to give rise to a more coherent body of knowledge but, it was not the scientific field per se that provided the impetus in this direction. The initiative for the establishment of departments/faculties in which Human Movement could be studied in a focused, scientific, way came, rather, from those professional fields concerned with the influencing of human movement - particularly that of Physical Education. While developments of the kind outlined obviously had an effect on those professional fields concerned with the influencing of human movement - particularly that of Physical Education, Physiotherapy, Ergotherapy, Rehabilitation, Sport, Pedagogy, Dance and the Performing Arts etc.) it was the increasing pressure to come to terms with the scientific body of knowledge underlying their professional area of concern which was the real impetus - a study that would supplement or replace the professional training which had persisted in one form or another since the turn of the century and which, in terms of academic content, was often seriously deficient.

This was only to take cognizance of the central issue to which Carr referred in 1980:
no educational practice is theory or value free and if it doesn’t follow from a body of coherent rationally informed judgements, then it will follow from a set of unreflectively common dogmas and prejudices.

The ‘writing was on the wall’ and the search was on for a body of knowledge that would lead to a better justification of, improvement in, and support for, the professional activity of influencing human movement. Since that time, the body of knowledge they were seeking has come to be known, internationally, as Human Movement Science. It is the nature of this field of study that needs, here, to be elaborated.

A good place to begin is with a question posed by the philosopher Renshaw (1975):

...is Human Movement an autonomous discipline or is it more appropriate to view it as a field of knowledge? If it fails to satisfy the conditions of a unitary mode of experience, is it possible to identify some central distinguishing feature?

Renshaw provided his own answer, namely, that Human Movement Science can be described simply as those areas of study which are concerned with the phenomenon of human movement, thereby acknowledging the importance and contribution to be made by such disciplines as philosophy and the biological, neural, physical and social sciences. Such a viewpoint leads to the conclusion that Human Movement is a field of knowledge and not a logically cohesive, autonomous discipline like mathematics or physics. Renshaw points out, further, that:

The study of the myriad forms and functions of Human Movement does not depend on one distinctive mode of thinking or method of enquiry. Its knowledge is not organised around a single system of interlocking principles concepts and definitions designed to direct attention to a particular type of question or way of looking at the world. Rather the events and phenomena associated with human movement can be understood only through several interrelated yet distinctive,conceptual perspectives.

This in itself should not prove surprising when one considers the multifactorial nature of any real life situation. A motor-impaired child, for example, may be simultaneously a neurological, an emotional, a social, a diagnostic and an educational problem. The specialized approach and data from one narrow discipline area may be entirely out of place, on its own, in deciding upon the mode of intervention in each individual case. Such a multidisciplinary approach, however, is not to be construed as a collection of disparate data and information but as an integration of knowledge:
...like cloth woven in several colours on both warp and weft, so that if you then remove one colour entirely you destroy both the pattern and the soundness of the cloth (Watts, 1976).

Perhaps, not surprisingly, given the developmental stage of the field, the integration of knowledge about human movement from diverse disciplines has been limited. This has much to do with the distinction made by Wilberg (1973) between 'recipient' and 'generated' knowledge. The emergence of a new field of study - like human movement - is dependent, initially, on recipient knowledge that is to say, knowledge gleaned from those disciplines which already have something to say about the phenomenon in question - how else can a start be made? This is a state of affairs, however, that cannot be tolerated for long if the new field of study is to become established. The pressing need is for knowledge generated from within the field and integrated into a meaningful whole if the field is to develop into something more than a mere accumulation of isolated pockets of information and research findings. In this respect, cognizance needs to be taken of Saugstad's (1977) concept of reference systems:

I could state as my belief that theory construction in science is essentially concerned with the question of how to develop reference systems which allow research workers to deal with various types of events. I shall say that the aim of the theorist is to construct a reference system which, from the point of view of the events to be studied contains the presuppositions made when something is regarded as some type of event, and which from the point of view of the reference system can be regarded as the specification of a domain which is of such a nature that certain types of events can be identified. In the construction of the reference system the theorist must have in mind what may possibly constitute types of events which may be fruitfully studied as well as what may possibly represent the domain in which types of events to be studied are contained.

Fortunately, since the early '70's - at which time the first seeds were sown from which Human Movement Science Departments/Faculties have developed - there has been considerable progress in identifying the domain of Human Movement Science, although much remains to be done. Breaking down the boundaries between those disciplines which are addressing themselves, forcefully, to the study of human movement is not an easy task. The most positive steps in this direction have been made by two Faculties/Departments, on opposite sides of the world established in the early seventies to study human movement from a scientific perspective. Since that time they have attained national and international recognition. Both had
their roots in professional fields concerned with the influencing of human movement (notably Physical Education).

**Department of Kinesiology**  
**University of Waterloo, Ontario, Canada**

The Department in Waterloo defines Kinesiology as the ‘Scientific Study of Human Movement’ from basic issues to applied aspects. The scope of research interest ranges from cellular work, to the examination of systems that support and cause movements, to exploring movement behaviour in society. The Department is characterized by four areas of specialization with collaboration between faculty members being guided by theme research questions:

- Biomechanics
- Psychomotor Behaviour
- Sociology of Sport
- Work Physiology

It also offers a Kinesiology Ergonomics option. From small beginnings in the late sixties/early seventies, this department has grown into a large enterprise with a total undergraduate enrolment (years 1989-92) of 1,048. Between 1990 and 1992, 32 M.Sc degrees were awarded and, in a similar period, 22 Ph.d students registered with the Department.

At that time the Department had an academic staff of some 32 members (among which, 9 full professors and 14 associate professors) and listed some 313 academic publications over the years in question.

**Faculty of Human Movement Sciences**  
**Free University, Amsterdam**  
**The Netherlands**

From a modest beginning in 1971, when it was designated an Interfaculty of Physical Education, full faculty status was granted in 1987 and this was accompanied by a name change to Human Movement Sciences which more aptly reflected its aims, namely:

The increasing of fundamental knowledge about human movement and developing strategies for influencing human movement in diverse fields of application from Natural, Medical Biological and Social Scientific perspectives.

The Faculty, currently, comprises seven departments:

- Educational Sciences in relation to Human Movement
- Functional Anatomy/Biomechanics
- Exercise Physiology and Biophysics
- Muscle and Exercise Physiology
- Psychology of Human Movement
- Health Sciences in relation to Human Movement Theory and History of Human Movement Sciences.

The research of the Faculty is concentrated in four research programmes which are theme oriented and, in some cases, multidisciplinary:

- Complex human motor actions
- Children at risk
- Cyclic movements
- Muscle and is, peripherally, involved in some 6 applied projects:
  - Physical exercise and mental health
    - Psychomotor therapy with senile dementia patients
  - Effects of motor remedial teaching
  - The Amsterdam growth and health study
  - Work load
  - Wheelchair propulsion.

The Faculty has some 700 students - all pursuing their studies for a period of 4 years culminating in a master's degree during which time the aim is to provide them with an education which will enable them to carry out and appraise research (findings) and to be able (if so required) to apply that knowledge in diverse fields of application in which movement plays a role (e.g., sport, work, therapy and rehabilitation, ergonomics etc.). There are some 20 Ph.d students currently registered.

The Trondheim Model:

Any university in Norway - or for that matter any other part of the world - deciding to establish an academic study 'Human Movement Science' has, at least, these two models in front of them. A decision could of course be taken to simply adopt either one of the models as it stands - but that would be to limit the University to the status quo. While both Waterloo and Amsterdam have a primary focus on fundamental science of human movement, both pure and applied research projects are evident. This, in itself, is a good thing but decisions, in this respect, have been ad hoc rather than part of a policy or model which has guided their development. This is not a point of critique, both Departments were pioneers in the development of Human Movement Science and the models they developed were constrained by their histories. With these models now available it would be hoped that any university wishing to embark on a similar exercise would profit from their experience. This is what the authors of this article try to do in proposing a new model designed to take advantage of the better aspects of the two existing models.

Developing the model

From the body of fundamental knowledge available about human movement, there is information which has considerable implication for students in the professional fields of application (physical education, sport, physiotherapy, occupational therapy, ergonomics, dance and theatre arts to name but a few). There are good arguments why the training of people in such professional fields should be grounded in a theoretical body of knowledge about human movement.

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1 This was the first Faculty in The Netherlands to be allowed to offer a master's degree over the shortened period of four years. Students in other faculties were still working on programmes which lasted for 6+ years. It is only within the last seven or eight years that the four year programme has become the norm in the Dutch system.
The difference between the academic human movement scientist and the practitioner in the fields concerned with the influencing of human movement is the extensive knowledge that the latter require, and acquire, about the application of such knowledge to real-life problems. It seems fitting, therefore, that research directed to the solving of practical problems encountered in such applied fields should be carried out by people who not only have a firm grounding in the academic study of Human Movement per se, but also have extensive knowledge and practical skills in their area of professional specialisation. It is this dichotomy that lead to the proposed Trondheim model of Human Movement Science:

- A central academic study of Human Movement Science centred on the University and staffed by academic personnel with the following teaching perspectives on the phenomenon of human movement:
  - Biological/physiological
  - Anatomical/biomechanical
  - Psychological
    - Experimental
    - Developmental
    - Social
  - Neuroscientific

Research activities of such personnel would centre on central, and fundamental themes about human movement (to be developed) which would be tackled in a multidisciplinary way.

A number of formally or informally related satellite, self-standing institutions, concerned with the influencing of human movement preferably, but not necessarily, with close bonds to the University e.g., medicine - particularly child development, rehabilitation, physiotherapy and ergotherapy, sport, pedagogy, ergonomics, dance and the performing arts, etc.

The relation between the Central Institute and the satellite institutions would be two-way - real-life questions from the satellite fields of application being used by scientists in the central institution to generate meaningful research with a more general application. In turn, it would be expected that the central institution (Department) would serve as a knowledge-base for the satellite institutions and would be active in providing research training for members

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1 Different universities may, of course, in the light of their histories, wish to qualify particular aspects of the model. For example, at the University of Trondheim, the proposal is to develop an (English language) M.Sc degree in Human Movement Science alongside the existing Hovedfag in Sport Science. The groundwork has already been laid for research working relations with the Faculty of Medicine and the Department of Physiotherapy in Trondheim.
of such institutions who, in consequence, when they returned to their satellite institution, would be capable of generating applied research which has meaning in the context of their everyday work.

The authors sense that the climate of opinion is ripe in Norway for important developments in the field of Human Movement Science. Any university deciding to take advantage of the model proposed in this document is likely to see rapid scientific development on a wide front that will not only profit its own students but will provide an invaluable service and focal point to all those professional bodies/departments around the country concerned with the influencing of human movement.

REFERENCES


