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*Mini Review*

## **Impact of Improved Facilities on Medical Education Outcome: Lessons from the United States**

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**ABSTRACT:** Biomedical Science departments are usually physically and functionally located in medical schools where the focus is generally on medical education. Recent trends in academic medical centers (AMCs) in the United States of America have led to structural changes in academic departments. There is lack of research on the outcomes such changes in medical education oriented AMCs have on basic science education and research. This review focuses on some changes in academic medical centers that may have had impact on structure and therefore functioning of basic medical science departments. Real or virtual driving forces are considered: structural adjustments in academic medical centers and academic politics; penetration of business theories into academic medical centers; power shifts in basic science departments; conversion of universities into research and financial institutions; acquiring famous faculty; multidisciplinary science replacing single disciplines; and devaluation of scientists. The author opines, in conclusion, that African academic leadership needs to do research on existing academic processes in order to guide decision making and to help African academia reach full potential.

**Keywords:** Biomedical science, basic medical science, research, education, academic department, driving force

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### **INTRODUCTION**

In the United States of America, biomedical science research has made giant leaps in the past three decades. The principles adopted and resultant forces of change have had an impact on the principal roles of research and teaching in universities. Because of research trends in the field of biomedical science, basic medical science or biomedical science departments in many universities have undergone major changes. This article looks at some driving forces of change in biomedical science departments. These are:

- structural adjustments in academic medical centers and academic politics
- penetration of business theories into academic medical centers
- power shifts in basic science departments
- conversion of universities into research and financial institutions
- acquiring famous faculty
- *Pot pourri* multidisciplinary science in place of single disciplines
- devaluation of scientists

### **Structural Adjustments in Academic Medical Centers and Academic Politics**

The philosophical changes in medical schools (especially problem-based learning and evidence based medicine) and the evolution of cutting edge research methodologies (based on molecular biology) have necessitated direct structural adjustments in basic science departments (Roush, 1997; Service, 1999; Metzger and Zare, 1999). Medical education curricula of academic medical centers that are based on integrative and multidisciplinary approaches have broken departmental barriers and have pooled diverse basic scientists (Mandel, 1997). Pragmatic approaches for increasing funding as well as for enhancing molecular biology-based "state-of-the-art" research have eliminated subject turfs. Classic examples of departmental mergers are: The University of California, Berkeley, The University of Colorado, Boulder, and Yale University (Roush 1997).

### **Penetration of business theories into academic medical centers**

Clinical income and research grants have become the means for financing academic medical centers (AMC's). Bloom (1992) describes the new corporate-style

bureaucracy guarding this principle in AMC's. Pragmatic approaches began to take over AMC's administrations and the relevance of basic medical sciences, the contents of basic medical science curricula, and the structure and leadership of basic medical science departments were brought under severe scrutiny, leading to change (Bloom, 1992).

### **Power shifts in basic science departments**

One pragmatic approach of AMC's to generate funding is power shifts in academic departments. Traditionally, a pharmacology department would be headed by a pharmacologist, a physiology department would be headed by a physiologist and so on. In more and more schools, the basic science curricula are becoming centralized and efforts are being made to eliminate departmental territoriality, to introduce interdisciplinary courses and problem based learning, to increase funding and save time, etc., (Hendricson *et al.*, 1993; Reynolds *et al.*, 1995). This has brought in a *status quo* in medical academia. For example, pharmacology departments are now headed by clinicians, biochemists, physiologists, etc., in an effort to encourage innovations, multidisciplinary research and collaborative efforts (Neufield and Barrows, 1974; Bouhuijs, 1990; Cohen *et al.*, 1994). With current trends towards "systematic exploitation of public research resources" the steering of institutional activities by "transaction specialists" (Kurland, 1997) rather than departmental subject experts has become necessary. This is a threat to preservation of the subject of the department especially in Ph.D. programs.

### **Conversion of universities into research and financial institutions**

The scholarship paradigm has continually shifted more and more toward research in American colleges and universities (Boyer, 1990; Fairweather and Rhoads, 1995). The relevance of each component of the traditional triad in the dynamic scholarship equation: teaching, research and service is continually queried. In fact, for some time now research may be thought to be synonymous with prestige (Alfred and Weisman, 1987) and the "publish or perish" emphasis is well-established in the promotion and tenure process (Alpert, 1985). It has been widely accepted that scholarship (research) keeps the mind supple whereas teaching deadens and rigidifies academics (Sheridan, 1990). However, the major interest may be financial: "Without doubts, the new partnership between academia and the private sector has been good for Americans. In 1999, technology transfer from universities to industry contributed \$38 billion to the economy, creating over 300,000 jobs and forming hundreds of new companies" (Hall and Scott, 2001).

In countries such as Nigeria, there are distinct universities, research institutes, and pharmaceutical and technological industries. There, a three-pronged scholarship of teaching, research and service may be seen within universities. Subject turfs belong to the universities, hot topics belong to research institutes and industry may be friend or predator toward all (personal observation). Basic medical scientists in universities in Nigeria teach, do research and provide service. Scientists in institutes and industry research on specific funded projects controlled by stakeholders: government, professional bodies, companies, or individuals. Collaboration may exist amongst all.

— In the US, a survey by the Carnegie Foundation for the Advancement of Teaching (1987) found that 4-year colleges and universities were broadly divided into research-oriented (which award doctorates) and teaching-oriented institutions (mainly liberal arts institutions awarding master level degrees) (Boyer, 1990). Presently, research-oriented universities are continually being converted to research institutions with less and less regard for teaching and service roles of faculty. Capitalization of research has become a key focus of many universities and by 2007 the massive industry resulting can be appreciated in available statistics with \$48.8 billion in universities research expenditures in 2007, \$3.4 billion in industry research performed at U.S. institutions and 5,109 licenses and options signed, 3,622 patents issued for the fiscal year 2007 (Market Research Company, 2010). The trend is also throughout industrialized nations (Fears *et al.*, 1997). Kurland, (1997) views a serious dimension in this trend: "the openness of the academic research is contrary to the secrecy of industrial and State research". Academic research with industrial prospects may tend to the shrouded in secrecy. Furthermore such trends necessitate the steering of institutional activities by "Transaction specialists" rather than departmental subject experts (Kurland, 1997). Kurland therefore suggested that scientists must lobby for laws that regulate the activities of industry on university campuses.

Research commercialization has disturbed the educational role of academia, but some also believe "the money making academy" has not profited the public with lower tuition, cheaper drugs, reduced budgets and demand a return to free academic research (Chao, 2002). Garrison *et al.* (2000), studying the composition of scientists making up The Federation of American Societies for Experimental Biology (FASEB) indicated that most of the registered scientists work in universities and only 9.7% were in the industry with a smaller proportion in hospitals, government agencies, and research institutes. Research has become the income generator of basic science departments "The historical

roots of today's federal research enterprise are at once complex and simple. They are complex in that many forces shaped its parts, but at its roots each of these forces is reducible to one of three categories –war, crises, or needs” (Metzger and Zare, 1999). The role of science in World War II led to post war rapid developments of the National Science Foundation and the National Institutes of Health. National concerns such as Sputnik, the Arab oil embargo, environmental problems, and economic competitiveness (especially with Japan) continually spur scientific research (Metzger and Zare, 1999). Since no parallel educational funding impetus exists, research issues overwhelm educational issues. In fact the normal scientist is now equated with researcher and placed on a research track on which his survival depends solely on his grants and publications (Alpert, 1985; Boyer, 1990) as opposed to a few faculty that struggle onto a more secure regular track in which they are given minimal teaching and service duties but not without first publishing extensively and obtaining substantial grants.

#### **Acquiring famous faculty**

Acquiring famous faculty is now standard practice (Honigman, 2001). Rajan (2001) explains how in his institution, new basic faculty are employed based not on their subject background but on their work on hot areas of research likely to generate NIH funding. Although the author could not locate published records about the rate of this trend, most scientists in other universities may have seen the same operation in their departments in recent times. Bloom (1992) identified targets for reform: “structural problems of organizations, the sources of authority and allocation of resources, and the power centers of decision making”. These intentional reform efforts are intended to benefit medical students' education or financial interests of the institution (Bloom, 1992; 1995) but studies are needed to determine their effects on education of basic medical scientists or to establish what trends they precipitate in basic sciences.

#### **Pot pourri Multidisciplinary Science Replacing Single Disciplines**

Some educators, such as Prockop (1992), proposed that the unifying concepts inherent in molecular biology represent a paradigm shift that might provide a foundation for interdisciplinary knowledge base that would obviate the need for discipline-based departments. Indeed basic sciences which were completely discrete from one another (Kornberg, 1988) have now effectively merged into a single discipline (Service, 1999; Metzger and Zare, 1999; Roush, 1997). Examples are at the University of California, Berkeley, Los Angeles and Santa Cruz; Duke University; Yale University; Michigan State University; Harvard University; University of

Pennsylvania; Princeton University; and the University of Illinois (Roush, 1997). The mergers have extended to the physical sciences (Service, 1999) in order to utilize whatever technique that works. This move is excellent for research but may have the opposite effect on disciplinary teaching. The author could not locate literature showing that such “Jacks of All Trades” (who may be “Masters of None”) pose a danger to basic sciences teaching in that even though they are topic authorities and experts in a field of research, they may be unlikely discipline loyalists and possibly lack the preservation instinct of discipline authorities. The interdisciplinary move in science graduate programs is an evolution from interdisciplinary move in sponsored research and it has not been rigorously scrutinized by educational research. It is recognized that some researchers are not interested in teaching, some lecturers are not interested in research, and some academics are equally interested in both. There is a lack of evidence that interdisciplinary researchers may be unable to guard educational roles of the basic science departments. If the latter holds, these roles may eventually disappear or become impoverished.

#### **Devaluation of Scientists**

The ease of getting foreign MD's, Ph.D.'s and graduate students from Asia as well as from Eastern Europe and other parts of the world has long made it possible to pay very little for bench work in US universities (Mervis, 1999; Gerbi et al., 2001). Nockleby (1995) gave a strong critique of this trend: "the world's richest, most high-tech nation is producing and importing too many scientists, engineers and physicians, thus creating a new class of super-educated, embittered unemployables." "The academic chiefs ignored the glut for a long time, finding reassurance in dubious official statistics of low unemployment among their professional kin". Nockleby went on to quote publications around that time: "The headline of an article in Science magazine asks: 'Is It Time to Begin Ph.D. Population Control?' A conference announcement from the Association of American Medical Colleges wonders: 'Is the Nation producing an Oversupply of Medical Researchers?' A commentator in the *Scientist* notes the production of 'new graduates to fill non-existent jobs' (Nockleby, 1995). Despite such views, H-1b visas issued for temporary, highly skilled foreign workers was increased from 65,000 to 115,000 in 1998 but this allocation was exhausted by June 1999. In the fiscal year of 2000, the allotted 115,000 visas were exhausted by mid-March. Soon after, bills in Congress were proposing a raise in the annual allotment from 195,000 to 200,000 over a three-year period or to provide an unlimited number of H-1b visas subject to various conditions (Middleton, 2000). Nockleby (1995) also noted that

"graduate students are the serfs of higher education, working for paltry wages as teaching and research assistants. The professors need them, even if jobs are lacking when they graduate". McLellan (2000) opined that whereas the door was thrown open to bring in skilled foreigners, most of the immigrants have not been from Western Europe or Japan, but have come from developing countries and Eastern Europe, "are less than top level, and are willing to work for much less than their American counterparts for the prospect of receiving a green card". Graduate students and post-docs continue to form cheap workforce (Gerbi et al., 2001; Mervis, 1999). The direction of an educational program needs the active involvement of its constituents. The author opines that such workforce may lack clout for academic politics but could not locate any research or publication on this matter.

### Which Way Africa?

The author has stated facts that African universities and centers of learning have examples to follow or learn from. Decision making based on present needs or opportunities do not always include foresight of outcomes. Looking at existing outcomes of other peoples' decisions can be extremely helpful in determining paths to follow or not to follow. The basic medical scientists in African centers of learning direct the educational and research roles of academia in their fields. They have a role in acquiring knowledge, preserving knowledge, imparting knowledge, and utilizing knowledge. These roles should not be compromised by inadvertent submission to driving forces but should be enhanced by enlightened direction and utilization of such forces if deemed profitable for the universities' mission. The starting point, however, may be to examine such forces of change, potential or real. The author in doing some research on academic structures and processes in academic medical centers (John, 2003; 2009; 2010) has observed that there is scarcity of peer reviewed scientific publications on such matters. Such leadership research should be encouraged to help African academia reach full potentials.

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