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The teaching of the Art and Science of Medicine

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The teaching of the Art and Science of Medicine^{*}

Dennis V. Cokkinos¹



Figure 1. Parliament Hall. Dennis Cokkinos at the podium.



Figure 2. The President of the Hellenic Republic Ms Katerina Sakellaropoulou in the centre. To her right Prof. Nektarios Tavernarakis Head of Institute of Technology and Research. To her left Nicholas Markatos former Rector National Technical University of Athens, Prof. Dennis V. Cokkinos. To his left Gerasimos Siasos Rector of National Kapodistrian University of Athens

Abstract

Teaching of medicine hails back to the age of Hippocrates; in the “Oath” he considers his teachers equal to his parents. Teaching, clinical practice and research constitute the three pillars of medicine, and they are interconnected. The methods of teaching medicine are very important. Auditorium lectures are being replaced by teaching in small groups and problem-oriented teaching. Still the enthusiasm of the teacher who can also become a mentor is a critical ingredient. The teacher should not just transmit but also create knowledge. The advent of artificial intelligence provides new auxiliary tools but also poses new challenges. We must not forget that we are shaping the future of tomorrow.

Key Words: *Education, research, clinical practice, mentor, artificial intelligence*

Your Excellency the President of the Hellenic Republic,

I want to thank you for the honour of your presence tonight. I consider this award to be the greatest possible distinction for an academic teacher. The Vasilios Xanthopoulos and Stefanos Pneumatikos Award es-

tablished by the Institute of Technology and Research of the University of Crete attests to the perennial value of teaching in every aspect of intellectual activity.

I accept this award on behalf of all the University Schools of Greece and their dedicated members, present and past. I am deeply touched by the fact that

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this award had been previously bestowed to my great teacher Konstantinos Gardikas who ideally embodied this profession exactly 30 years ago (Fig. 3).

As for the role of the teacher, Hippocrates was the first to indelibly stress the legacy of this art, in his “Oath”:

I consider him who taught me this art equal to my own parents.

All the great educational institutions must be rooted in tradition. We can still hear the words of Pythagoras: *One should leave behind him students.*

However, we must realise that tradition itself, without consideration for the future, is a fruitless pastime. According to the great American President Abraham Lincoln, to predict the future we must create it. It would be an inexcusable mistake to believe that our students are merely a population of malleable pupils to conform and obey, rather than our successors who will continue and advance our own work.

Dear Professor Nectarios Tavernarakis, Chairman of the Institute of Technology and Research; Professor Maria Euthymiou President, of the committee of awards of the Vassileios Xanthopoulos and Stefanos Pneumatikos Award; and members of the committee; honourable ministers; Mrs. Psarouda-Benaki, past president of the Hellenic Parliament; honourable secretary-general of the Ministry of Education; honourable Academician; Rector and past Rectors of the University of Athens; Mrs. President of the Association of Professors Emeriti of the University of Athens; Mr. President-elect of the European Association of Professors Emeriti; dear colleagues, university teachers; fellow Physicians; dear students; ladies and gentlemen.

The kind introduction by Professor Panagiotis Macheras, although somewhat of an overstatement

coming from this source, is a great honour for me.

The term ‘Profession’ includes all manifestations of the transmission of knowledge. In Plato’s ‘Protagoras’, it means stating clearly and succinctly the task performed¹. In Latin literature ‘professio’, according to Scriveronius Largo (1st century AD), signifies a statement of devotion and faith².

I had the fortune of being exposed to various aspects of teaching in my school, Athens College, which I attended as a recipient of a scholarship.

From my 6 years at the University of Athens I retain the best impressions. Public Greek universities provide important services and are ranked highly in all evaluation systems. They form the paragons of Hellenic and international society. At this stage of discussion of founding private non-profit universities, our state should provide them with every support.

I had the privilege of specialising in internal medicine under the great Professor Konstantinos Gardikas. In Houston, Texas, amidst the challenging work against pain and death, I was fortunate to form a close bond with my great teacher and mentor, Robert D. Leachman, whom I met during Ward Rounds and was impressed by his teaching prowess (Fig. 4).

I also experienced the inspiration of following the legendary Denton A. Cooley, the greatest cardiac surgeon of his time performing with dexterity equal to inspiration (Fig. 5).

At the Biomedical Research Foundation of the Academy of Athens, I had the opportunity to delve into the life’s work of academician Gregory D. Skalkas, a man with limitless vision and unequalled achievement. During this time, I had the privilege to communicate with young researchers and share their dreams and



Figure 3. Konstantinos Gardikas 1913-2003.



Figure 4. With Robert D. Leachman (Centre). The author is noted with the white dot (1970)

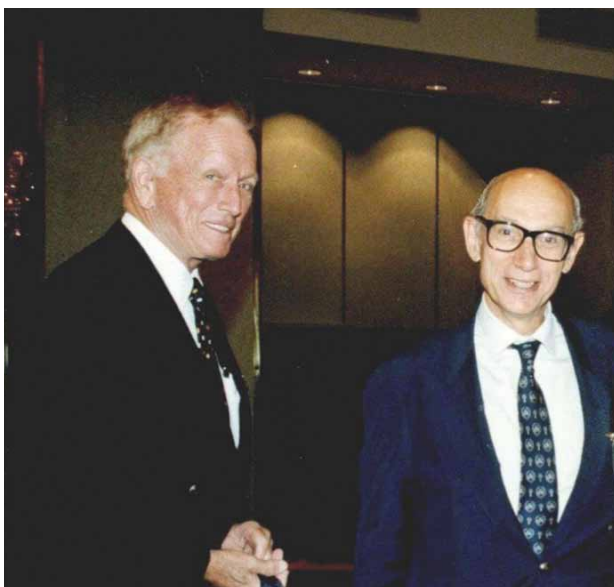


Figure 5. Denton A. Cooley (left) and Dennis Cokkinos.

quests (Fig. 6).

Teaching methods continue to evolve and progress. The laureates of the Xanthopoulos-Pneumatikos Award bear testimony to these efforts. Thus, amphitheatre time is reduced. However, this experience must not be abolished. Opening and closing lectures should introduce and recapitulate each year's efforts. Additionally, invited personalities can serve as inspirational models.

Teaching in small groups, problem-based, and question-based learning have been introduced. Careful planning is of course desirable. However, excessive attention to detail can become pedantic and tiresome. Technique should not kill art or "techne". However, certain elements never change: enthusiasm and vision. Without these ingredients and lacking inspiration while relying on high ideals and intellectual culture, the teacher cannot transmit his art and knowledge. God-inspired poet, Angelos Sikelianos, wrote in his great poem "The Clairvoyant" (Fig. 7): "So that I will

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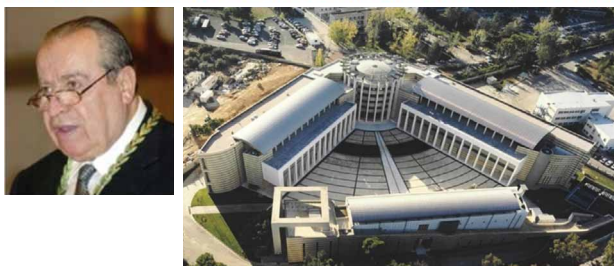


Figure 6. The BRFAA and its founder, Academician Gregory D. Skalkas.

serve with new wine all the youth around".

All definitions are, by definition, incomplete; therefore, the simpler ones should be preferred. According to Wikipedia:

Art is a diverse range of human activity, and its resulting product, that involves creative or imaginative talent generally expressive of technical proficiency, beauty, emotional power, or conceptual ideas.

A basic prerogative of art is technical dexterity, which empowers natural talent. However, empathy, compassion, and humanitarian spirit characterize the art of the physician^{3,4}. These qualities should be taught not only in the first preclinical years but also at the bedside in later years.

Above all, there is a supreme quality: the stance for life. Once again, Hippocrates stated in his "Oath":

I will maintain my life and my art pure and chaste.

Ethics and deontology are taught early in most medical schools, but they also should be recapitulated at later stages when the physician is exposed to the challenges of clinical practice⁵.

Additionally, moral courage should be taught. Aristotle lists it as the first virtue in "Nicomachean ethics". He aptly states that Socrates believes that courage is a "science" to be taught⁶.

An indispensable companion to the Art of Medicine is Science, which has, in reality, marked the history of humankind. A recent example: without vaccines and antiviral drugs, the coronavirus pandemic could have possibly wiped out humanity.

According to the Oxford Dictionary: *Science is knowledge about the structure and behaviour of the natural and physical world, based on facts that you can prove, for example by experiments.*

As for the emergence of science, already by the 5th Century BC, two giants of the Hellenic spirit marked



*"So that I will serve
with new wine
all the youth around"*

Figure 7. Angelos Sikelianos "The Clairvoyant", 1909. Thymélé, vols. 1-3. [Athens] 1950-55.

a seminal evolution within less than 50 years.

In his great tragedy “Prometheus Bound”, Aeschylus (525-455 BC) writes⁷:

I have stopped mortals from gazing at death.

This gift to humankind is ascribed to divine powers.

However, in his book on “Ancient Medicine”, Hippocrates (460-377 BC) ascribes this role to humans who take reign of their own fate⁸:

Now this need rendered medicine to be sought and found by humans.

It is acknowledged that scientific knowledge doubles every year, with electronic knowledge expanding even more rapidly. To effectively absorb and utilise these advancements, two key elements are necessary: the elimination of superfluous information and the cultivation of curiosity, encouraging the pursuit of new data and the formulation of questions over rote memorisation of answers. Naturally, a foundational body of knowledge is essential for any scientist, who cannot rely solely on sources such as Google. A teacher’s role transcends that of a mere manager; they must generate knowledge to garner respect.

Secondly, the procedure of research must be taught since research opens brave new worlds and is indispensable for progress. According to the National Science Foundation⁹:

Research is planned search or critical investigation aimed at discovery of new knowledge with the hope that such knowledge will be useful in developing a new product or service or a new process or technique or in bringing about a significant improvement to an existing product or process.

It must be understood that research, clinical practice, and education are the three fundamental requirements for the proper practice of Medicine (Fig. 8).

Research itself has three interacting and multidirectional facets: (Fig. 9)

For the correct teaching of clinical research to students and doctors in training, in addition to the University Hospitals, those belonging to the National Health System should be utilised. Our universities must expand their academic role to as many fixtures as possible with a primary role dedicated to State hospitals. The role of doctors serving in these Hospitals must be adequately acknowledged, potentially with the title of clinical professor which is a respected title in the United States. Of course, for basic and translational research, the excellent research institutions in this country must also participate. It is well understood that young trainees who also are trained in research have a much better career, both clinical and academic^{10,11}.

Of course, not only active university personnel

should be involved in the process of teaching and transfer of knowledge, but also emeriti and retired Professors in a recognised capacity. In this stage of their academic life, they are eminently suited to become mentors of the young. In Homer’s Odyssey goddess Athena was disguised as Mentor, an old friend of Ulysses, to help his son Telemachus in the quest of his father’s fate. Since then, the term “mentor” has been reserved for a mature, experienced, and unselfish preceptor who, out of interest, assists his younger peers.

In the last part of my address, let me briefly refer to the torrential avalanche of Artificial Intelligence, which has pervaded our lives and is essential for all expressions of life and science. As already stated, the explosive increase of knowledge and data renders its exploitation necessary. However, even on the pioneering other side of the Atlantic, it is stressed that artificial intelligence is not yet taught effectively in academic institutions and that it must be included in the curriculum. However, its teaching should be undertaken by experts and, if necessary, in collaboration with institutions dedicated to this purpose¹². At the Biomedical Research Foundation of the Academy of Athens, we have initiated a teaching collaboration with

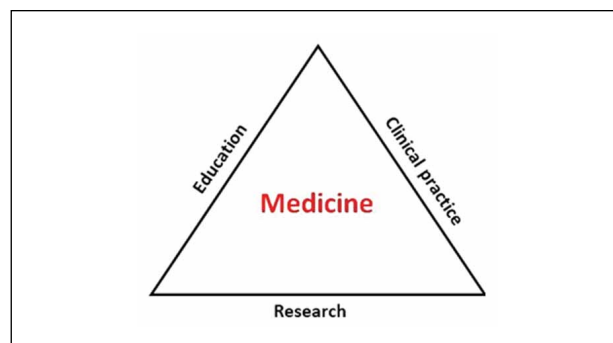


Figure 8. Education, Clinical practice, and Research are the three pillars of Medicine.

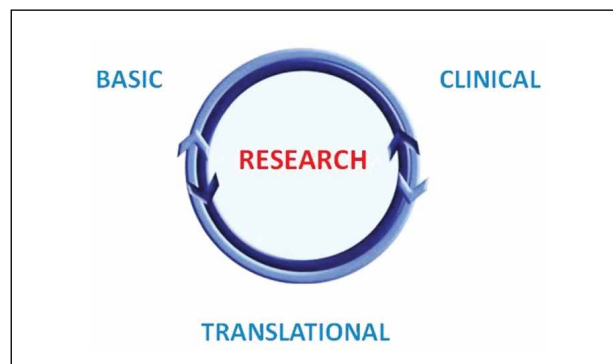


Figure 9. The 3 interesting facets of research.

the Research Centre Archimedes, which was created by the activity “Greece 2021”.

Importantly, as in all other expressions of science, there is a fundamental requisite: This effort should be undertaken seriously, sincerely, and not for financial gain or the ephemeral lights of notoriety.

Let the definition of Aristotle on tragedy guide us¹³.
An important and perfect action which has a large dimension.

Let us not forget that we are preparing the generations to come.

Thank you very much for your attention.

ΠΕΡΙΛΗΨΗ

Η Διδασκαλία της Τέχνης και της Επιστήμης της Ιατρικής

Διονύσης Κόκκινος

Η διδασκαλία της ιατρικής ανάγεται στον Ιπποκράτη, ο οποίος στον Όρκο του θεωρεί τους δασκάλους του ίσους με τους γονείς του. Οι μέθοδοι διδασκαλίας μεταβάλλονται. Η διδασκαλία από αμφιθέατρο δίδει τη θέση της σε μάθηση σε μικρές ομάδες και βάσει προβλημάτων, αλλά ο ενθουσιασμός είναι το κύριο συστατικό του δασκάλου ο οποίος πρέπει να παράγει γνώση και όχι απλώς να τη μεταδίδει. Ο δάσκαλος συχνά γίνεται και μέντωρ. Η διδασκαλία, η έρευνα και η κλινική πράξη είναι οι τρεις στύλοι της ιατρικής. Η έλευση της τεχνητής νοημοσύνης προσφέρει πολλά βοηθήματα αλλά δημιουργεί πολλές προκλήσεις. Δεν πρέπει να λησμονούμε ότι ετοιμάζουμε τη γενιά του αύριο.

Λέξεις Κλειδιά: Εκπαίδευση, έρευνα, κλινική πράξη, μέντωρ, τεχνητή νοημοσύνη

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