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Review

Mirko Dražen Grmek: The Genesis of Scientific Fact and Archaeology of Disease

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A B S T R A C T

Professor Mirko Dražen Grmek (Krapina 1924 – Paris 2000) was one of the most prominent Croatian scientists. Work in history of science directed him to the crossroads of various fields placing his approach in anthropological perspective. Two models will serve as illustrations of his main theories. The historical reconstruction of scientific discovery (mostly on examples of 17th century) will be presented as well as Grmek's ideas on a concept of disease. The introduction of the term »memoricide« within his activities during aggression on Croatia is mentioned.

Introduction

Professor Mirko Dražen Grmek (1924–2000) was one of the most prominent Croatian scientists. Generations of students have based their studies on his concepts. The unique blend of biological, linguistic historical, and cultural investigations gave his approach an anthropological perspective. This paper aims to present several aspects of Grmek's ideas, specifically focusing on the scientific ideas development and the concept of diseases.

The diversification of medical research and specialty practice goes back to 19th century. This resulted in a large number of issues being addressed and in part, remaining unresolved until our times, including individual as much as holistic approaches to the patient or basic questions such as how medicine should be conceived in relation to other sciences, to nature and to living organisms. Striving to find answers, Grmek deviated from the course of making specialisation as most medical practitioners did, but occupied himself with the research of the history of sciences. Stimulus appeared with interest in history of medicine while he was still a student. History of medicine became a strong stimulus for him while he was still a student. Later it turned into elaborating and documenting

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opera of the most prominent Croatian physicians and scientists throughout history[1]. The content and main purpose of those early papers about G. A. Baglivi, Santorio Santorio, Federico Grisogono, Ruđer Bošković etc.[2–5] was already directed to analysing not only the background of their contributions but also the origins of their ideas.

Constructing a Scientific Fact

In 1963 the College de France invited Grmek to Paris to analyze the legacy of famous French scientist Claude Bernard (1813–1878), the founder of modern experimental physiology[6]. Bernard´s scientific discoveries aside, his work is of prime importance for the history of science because he may be considered the conceptual father of the epistemological shift in medicine that introduced the experiment as the prerequisite for the acquisition of knowledge. Bernard's book »Introduction to the Study of Experimental Medicine« was the Bible of the newly emerging experimental medicine. In this setting, the dynamic concept of disease, in which disease was perceived as a dynamic process involving both noxic agent and response of the living body, has prevailed over the older patho-anatomical concept that accorded crucial importance at post-mortem examination of the dead body.

While reading, selecting, organizing and transcribing Bernard's laboratory notes, diaries, random papers and scribbles, Grmek was able to witness first hand the recording and documenting of scientifically relevant results/facts from the very beginning to the end of an experiment. This was a tempting opportunity for a historian of science. We would like to suggest that, in a way, Grmek was implementing to history of science the approach similar to the one that social anthropologists (such as Latour and Woolgar) were employing to record the science in making in modern laboratories.

The success of the work on Bernard instigated Grmek to further explore history of creating scientific knowledge. He took interest in a wide range of problems in the course of his career. Probably the best rounded »series« of studies is the one on 17th century science and medicine, and, in particular, about school of iatromechanists[8–10]. Grmek's interest in 17th century science dates back to the beginning of his career when he studied the work of Santorio Santorio and Gjuro Baglivi. Moreover, the 17th century was the time of a mechanistic revolution that introduced experimental quantitative method into science. This revolution in »hard sciences«, especially physics, did not revolutionize medical practice – this happened 200 years later – but it had a major impact on biology.

The most important pieces from Grmek's research of the 17th epistemological revolution in science were compiled and reinterpreted in his widely acclaimed book »The first biological revolution« (Figure 1)[11]. This 1990 book comprises several ideas that Grmek previously developed in separate studies, which share a common feature of having importance for the advancement of medicine and physiology. Through examples from the history of research of vision, blood circulation, microstructure of the body et cetera, Grmek emphasizes three main ideas: (i) introduction of animal experiments and a move from qualitative to quantitative experimentation in medicine; (ii) a mechanistic explanation of life and (iii) the establishment of the »new medicine« based on an emerging new science of life.

A chapter on Santorio Santorio and »knowledge networks« in early 17th century exemplifies well Grmek's approach to the historical study of the genesis of scientific knowledge. The move from the particular to the general, to the viewpoint

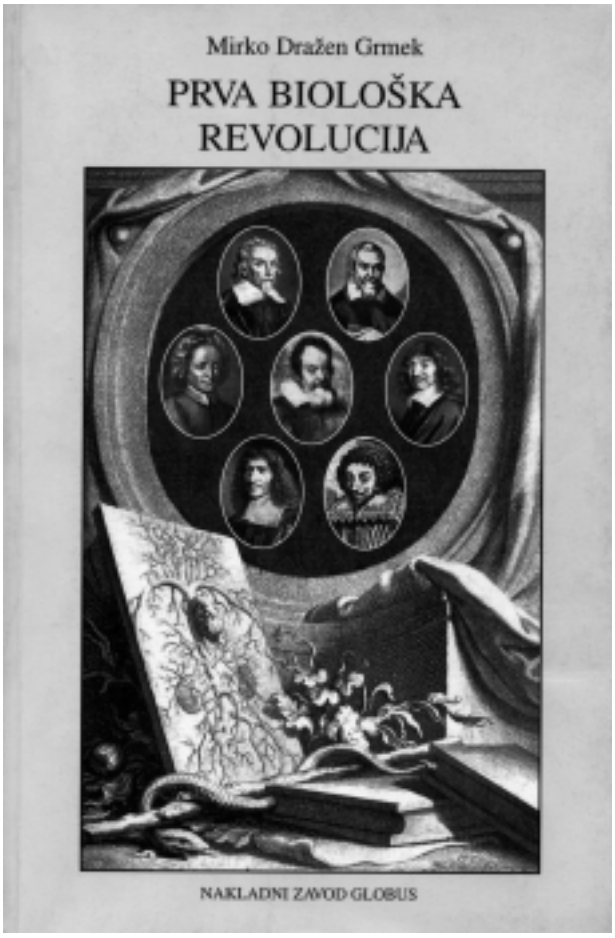

Fig. 1. Cover page of the Croatian edition of »The first biological revolution«.

that allows a wider and more objective observation, is particularly evident when comparing Grmek's early work to his later studies.

Santorio Santorio was a seventeenth century physician and scientist who introduced quantitative measurement into medicine. He believed that »medicine has the value of a hypothetical science because the physicians ignore the quantity of the disease, the quantity of the remedy, the quantity of the virtue«[12]. Thus Santorio Santorio's goal was to create instruments that would allow measurements in medicine. He constructed pulsilogium to record the frequency of pulse and anemometer to measure the force of the wind. He also perfected Cusani's hygrometer and constructed a thermometer, probably his most famous instrument.

In his early 1947 and 1952 papers, Grmek acknowledged the importance of influence of Santorio's predecessors (Galen, Heron etc.) as well as contemporaries on Santorio's inventions, but he nevertheless focused exclusively on Santorio's own

work. On the other hand, in the chapter on Santorio Santorio in »The first biological revolution«, Grmek placed »knowledge networks« in the history of scientific research right in the spotlight of his interest. This concept was originally developed by social anthropologists and sociologists who studied the development of a scientific fact through interaction of numerous scientists using various informal and formal communication channels[13]. Although developed in the milieu of twentieth century high-tech laboratory science, Grmek has shown that this concept can be successfully applied to the setting of the early age of modern science, i.e. the seventeenth century, as well. Two key players in the network that he examined were two contemporaries and acquaintances, a physicist, Galileo Galilei, and a physician, Santorio Santorio. The question was to determine to whom does the primacy belong, for the invention of thermoscope and thermometer. Grmek was not interested in the definite answer to this question. He did argue that Santorio was the original inventor of those instruments, and his hypothesis was that scientific ideas do not exist in the vacuum. Santorio Santorio would never have created his thermoscope and thermometer if Galileo Galilei had not carried out his work in physics (thermodynamics). Accordingly, Grmek was interested in the way how bits of knowledge were exchanged between Galileo Galilei and Santorio Santorio. He examined formal (lectures, books) and informal (letters, mutual friends, public events) communication channels.

A scientist about whom Grmek wrote the most, after Claude Bernard, was probably Giorgio Baglivi (1668–1707), the famous physician of Dubrovnik origin who left his hometown at an early age to pursue a splendid career as clinician and scientist in Italy. As a scientist, he belonged to the circle of iatrophysicists whose philosophical concept of the human body was close to Cartesian idea of the human machine. Baglivi stated that the basic unit of the organism was a living fiber, of whose state of tension or laxity depended health, or sickness of the body.

Two facets of Baglivi's career – clinical and scientific – are reflected in his two books, »De praxi medica« and »De fibra motrice et morbosa«. Scholars studying life and work of Giorgio Baglivi, including Grmek, emphasized the dichotomy between Baglivi, the conservative medical practitioner holding tightly to postulates stated by Hippocrates, and Baglivi, the modern scientist combining Galileo's ideas of experimental deduction with Baconian empiricism. However, in his late works, Grmek thought that the dichotomy in the person of Baglivi was only superficial[14]. Baglivi selected from Hippocratic teaching things what he found useful for medical practice, such as giving more importance to clinical observation than to theoretical education and keeping therapy simple. This »neohippocratism« was a popular movement in 17th century, and a natural response to polypharmacy and insufficient clinical education of physicians. On the other hand, he never supported Hippocratic humoral pathology and went so far to bend Hippocratic teachings in order to fit into the frame set up by mechanicistic philosophers, primarily Descartes, and iatrophysicists.

In the chapter »The concept of the living fiber« in »The first biological revolution« Grmek used the example of Baglivi and others to explore the creation of scientific knowledge – this time, a scientific theory – in a different manner than he did with Santorio and Galileo[11]. In the chapter on Santorio, Grmek examined ways how Santorio and Galileo linked pieces of knowledge that were already available because they were produced either by their predecessors (for example, ancient Greeks) or contemporaries. In contrast to that, in the chapter on the liv-

ing fiber, Grmek studied the way how one scientific theory gives birth to another: i.e. what are basic criteria for a scientific theory to be considered as a (crucial) predecessor of another. In this case, he argued that Anthony Leeuwenhoek should not be regarded as the ancestor of Virchow's cellular theory – the postulate upon which the modern biology is based, saying that a cell is the basic unit of a living structure. Anthony Leeuwenhoek, Dutch optician and microscopist without much knowledge of medicine and science, while examining a particle of cork noticed its network-like structure with fine walls dividing hollow spaces. Grmek emphasized that what Leeuwenhoek had seen were walls, and not the living structure inside. Leeuwenhoek, though a brilliant microscopist, was an outsider who could not have, and did not have an idea of what could be a basic unit of living tissue. Thus the use of the microscope was necessary, but not vital for the establishment of the cellular theory: what was of highest importance was the idea of a basic functional unit of a living structure, no matter whether it is called a cell, globule – or a fiber. Precisely from that functionalist viewpoint Grmek further develops his thesis that the theory of the living fiber should be regarded as a precursor of cellular theory of nineteenth and twentieth century.

While working in the field of history of science, Grmek managed to keep in touch with scientific advancements of the day. This enabled Grmek to gain a wider perspective of development of science and to envisage his concept of three epistemological revolutions of biology and medicine. The first one, the 17th century mechanistic revolution, established the experimental quantitative method. Grmek's work on Claude Bernard gave him an opportunity to closely observe the second one that introduced experiment to medicine and revolutionized medical practice. On the basis of his experience with two epistemological revolutions in the past, Grmek was able to draw analogies to the scientific revolution that is taking place right now. He pointed out two resemblances between 20th century scientific revolution and two previous revolutions. Firstly, acceleration of time – it took 1500 years from Galen to 17th century, but only 200 hundred from the first to the second and merely 100 hundred from the second to the last epistemological revolution. Secondly, he introduced the notion of »cybernetic interplay« (le jeu cyberneutique), meaning that new ideas are necessary to create new instruments and tools but then new instruments and tools create new ideas and so forth. The concept of information, crucial for the twentieth century epistemological revolution, has a wider meaning than is usually considered. It does not relate only to the widespread use of computers and the creation of a global computer network, but it also encompasses the research and disclosure of information comprised in the genetic code[15].

Archeology of Disease

Until recently history of diseases was investigated analytically in separated studies of one disease or a group of diseases and many important facts were neglected. The main goal was to reveal the historical background behind the framing of a group of symptoms as a separate nosological entity[16]. This approach was successful but it lacked »big picture«. A more encompassing approach was lacking and Grmek's attempts were to set diseases in a coherent frame of their occurrence.

Bubonic plague – quarantine measure

Epidemic diseases and medical systems within societies were a challenging arena for Grmek´s research. He investi-

gated conceptions of infection, focusing on health care decisions and alternatives in various periods and cultures[17,18]. His interest was directed particularly to circumstances and causes that lead to the establishment of quarantine in Dubrovnik in 1377, as the first such measure in the world[18,19]. The 14th century bubonic plague »Black Death« killed a quarter of the European population and it was mostly fought by magic and religious invocation while the majority of medical theories were loyal to Greek tradition and Hippocratic miasmatic theory. Seeking to protect themselves, physicians were wearing masks with snouts stuffed with aromatic herbs, emphasizing individual treatment, recommending all kinds of different disinfecting provisions. Under the circumstances of dominant religious and environmental (miasmatic) theories persisting during medieval period, the question was how did such pragmatic measures of isolation occur at all? The most important goal was to prevent the spread of the plague in Dubrovnik without impeding the free trade vital for the city. Physicians alone were unable to influence public-health measures. Thus the Great Council of the city, consisting of noble tradesmen, was responsible to maintain free trade. Previous historical models of isolation such as ancient Levitical decrees and medieval leper laws of segregating lepers from the rest of society, Grmek found of utmost importance for development of anti-epidemic measures in Dubrovnik and elsewhere [18]. Due to its pragmatic purpose and its occurrence two centuries before Girolamo Fracastoro explained the notion of contagium, the priority and originality of quarantine institution in Dubrovnik, was pointed out by Grmek.

Pathocoenosis

To make his views more intelligible Grmek introduced the term pathocoenosis meaning (i) pathological conditions that exist in a certain population at a given time (ii) the prevalence of diseases caused/influenced by genetic and environmental conditions and by other diseases, (iii) a phenomenon that inclines to equilibrium

Diseases that are constitutive elements of pathocoenosis could be in a relation of symbiosis, antagonism or indifference to each other[20]. Based on a variety of sources, from texts to objets d´art, from paleodemography to genetics, immunology etc. Grmek analyzed several groups of diseases and based his analysis on their history and epidemiology. We will focus on his elaboration on leprosy.

Leprosy

Leprosy provided a prism for original starting points and synthesis elaborated in the book *Les maladies a l'aube de la civilisation occidentale*, and in several papers [20,21]. Founded on osteoarcheological, artistic and literary sources, explaining semantics of the term in various medical texts of Greek and Roman periods, Grmek argued on possibilities of making retrospective diagnosis as well as on its historical epidemiology. *How old Mycobacterium leprae is? Where is the clue of its puzzled history? Why did it decline by the end of 14th century? How is it connected to other diseases, namely tuberculosis, which has a similar but far more aggressive pathogen?* To link one disease to another means to trace their causative organisms in humans as well as in animals back to past periods, to follow their transmission etc. Leprosy and tuberculosis were good examples (Figure 2)[20].

Emerging Disease

At all times »new« diseases appear. Sometimes they are evolutionary mutations, sometimes they appear as a result of environmental disturbance or social change. To avoid misinterpretations Gr-

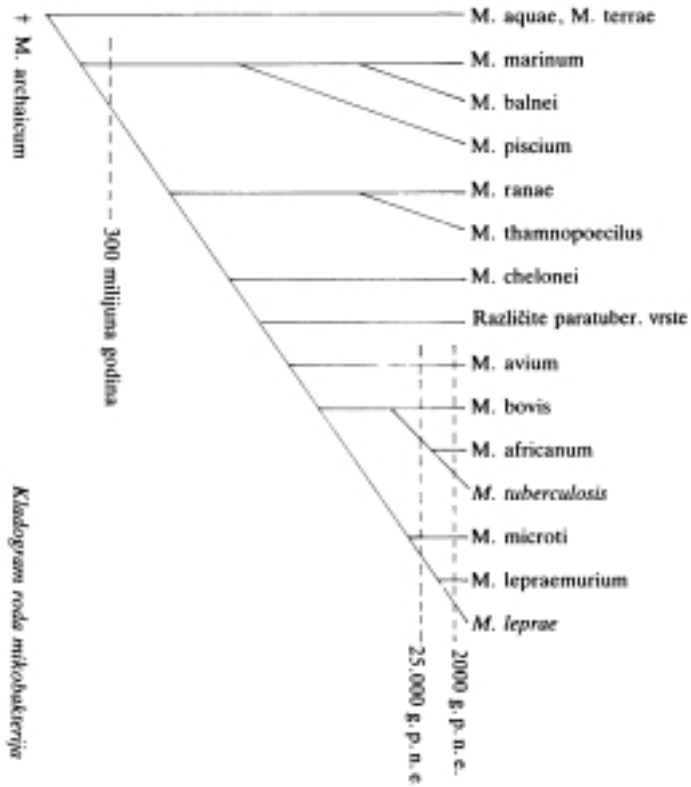

Fig. 2. Kladogram of Mycobacterium taken from the Croatian edition of »Diseases at the beginning of the western civilization«.

mek suggested substituting the ambiguous notion of »new disease« with *emerging disease*[22]. According to his opinion, a disease can be classified emergent in at least five different historical situations: (i) it existed before, identified but overlooked because it could not be conceptualized as a nosological entity (ii) it existed but was not noticed until quantitative and/or qualitative change in its manifestation (iii) it did not exist in a particular region before its introduction from other regions (iv)it never existed in human population only in an animal population (v) it is completely new meaning the triggering germ and/or environmental conditions did not exist prior to the first clinical manifestation[22].

AIDS

At the time Grmek began to write the book *Diseases in the Ancient Greek World*, an unknown catastrophic disease unknown until then broke out. A deadly disease – AIDS, with its crippling effect on the human immune system, spread and there was no vaccine, no cure, and no effective treatment. This was a tempting opportunity for Grmek to apply the investigative methods he introduced in the book on diseases in the ancient Greek world. The great outbreak of disease de-

veloped right before his eyes and he was inquisitive to find out if the knowledge and experience of a medical historian could contribute to elucidation of its epidemiology. Grmek used six methods in order to approach this new phenomenon[23]. Firstly he employed two clinical methods, out of which one was exploring AIDS symptoms in past individual histories, and the other was the study of geographical and diachronic variations in occasional infections like Kaposi sarcoma and pneumocystic pneumonia. The third, paleoserological method was used to look for specific antibodies in old cryopreserved sera. Further methods utilized modern molecular biology and genetic analysis in search for virus genome fragments in remains of the human body, and for reconstructing viral genealogy and tracing viral segments integrated in normal human genome [23–25].

Grmek has brought out his own hypothesis of the AIDS pandemia that combines biological and social factors (i) an application of the principle of Darwinian selection to the particular biological properties of HIV, and (ii) an application of the general concept of pathocoenosis to the specific case of AIDS[26].

Grmek described AIDS as a real metaphor of our time pointing out its beginning as a paradoxical and perverse effect of technological advancement and modern life style.

Memoricide

Grmek also estimated the impact of socio-economic factors on the progress of scientific thought. Although he did not deny the influence of ideology on scientific theories, he indicated that in the history of science »externalism« is a mirage, and pushed to its limits, an untruth. His observations on society, cross-culture and, recently, politics were fruitful because they introduced new and original explanations and terms. During the War in Croatia he presented the roots and origins of aggression on Croatia, the cultural and other causative mechanisms, which lead to its development.

As a Croat with both French and Croatian citizenship, he was in a particularly sensitive position because the French public traditionally kept a negative image of Croatia and sympathy for its aggressor. However, he also benefited of being a historian well versed in working with documents and historical data. Grmek was aware that writing history is very much like looking through a kaleidoscope: pieces can fall together in a million different ways. In an interview, just before the war, titled »History does not exist« he said »History does not exist because it is something that is gone forever. History is really investigating traces of the past in the present, which is something completely different«. Thus when explaining history of Croats and Serbs to a French audience, he put emphasis on original documents, as in the book on ethnical cleansing.

Besides deconstructing historically amiss claims, another way to present Croatia to France and the Western world was to get them acquainted with Croatian culture. One could hardly think of a better person than M. D. Grmek to justly portray ways that Croatian culture contributed to the common development of Western civilization. Thus we witnessed the second peak in his publications on Croatian scientists contemporaneously with the War in 1990es (the first one was at the very beginning of his career). This might have been triggered by destruction of objects of cultural and historical value that took place during the War, for which Grmek introduced the term »memoricide« that came into common usage. Memoricide meant the active intention to destroy all traces of cultural and historical

existence of a nation on a certain territory.

Small pieces of knowledge, interconnected with »right« or »wrong« fragments, create our perception of knowledge. It was a challenge for Grmek to investigate the miracle of creation of facts/results in each experiment, and in each direction. While investigating the process of creating, or constructing, a scientific fact, he tried to overcome dangers of fragmentation and accomplish complete picture. That led him to many fields from medicine to history and philology, from social epidemiology to medical anthropology augmenting thus our knowledge of humankind and illness.

REFERENCES

1. GRMEK, M. D.: Bibliographia Medica Croatica I-III. (JAZU, Zagreb, 1955-1984). — 2. GRMEK, M. D., Lij. Vjesn., 79 (1957) 599. — 3. GRMEK, M. D. Medicinar, 1 (1947) 181. — 4. GRMEK, M. D., Raspr. gr. pov. nauka, 6 (1990) 1. — 5. GRMEK, M. D., L'explication des phénomènes vitaux dans l'oeuvre de Boscovich. In: BURSILL-HALL, P. (Ed.): R. J. Boscovich. Vita e attività scientifica. His life and scientific work. Atti de Convegno Roma, 1988. (Istituto della Enciclopedia Italiana, Roma, 1993). — 6. GRMEK, M. D.: Le legs de Claude Bernard. (Fayard, Paris, 1997). — 7. LATOUR, B., S. WOOLGAR: Laboratory life: The construction of scientific facts. (Princeton University Press, Princeton, 1986). — 8. GRMEK, M. D., Morgagni e la scuola anatomo-clinica di Parigi. In: CAPPELETTI, V., F. DI TROCCHIO (Eds.): De sedibus et causis: Morgagni nel centenario. (Istituto della Enciclopedia Italiana, Roma, 1986). — 9. GRMEK, M. D., Mariotte et la physiologie de la vision. In: Mariotte, savant et philosophe; analyse d'une renommée. (Vrin, Paris, 1986). — 10. GRMEK, M. D., A survey of the mechanical interpretations of life from the Greek atomists to the followers of Descartes'. In: BRECK A. D., W. YOURGRAU (Eds.): Biology, history and natural history. (New York, 1972). — 11. GRMEK, M. D.: The first biological revolution: Thoughts on physiology and medicine of the 17th century. In Croat. (Nakladni zavod Globus, Zagreb, 1996). — 12. GRMEK, M. D.: Santorio Santorio and his machines and instruments. In Croat. (Jugoslavenska Akademija, Zagreb, 1952). — 13. BARNES, B., D. BLOOR, J. HENRY: Scientific knowledge: A sociological analysis. (Athlone, London, 1996). — 14. GRMEK, M. D.: Life, works and historical significance of Gjuro Baglivi. In: BAGLIVI, G. (Ed.): About healthy and pathological tissue. Croat translation of De fibra motrice et nervosa. (Zagreb, Prometej, 1997). — 15. GRMEK, M. D.: La revolution biomédicale du XXe siècle. In: GRMEK, M. D.: Storia de la pensée médicale en Occident. Vol. 3. Du romantisme r la science moderne. (Le Seuile, Paris, 1999). — 16. ROSENBERG, C. E., J. GOLDEN: Framing disease: Studies in cultural history. (Rutgers University Press, New Brunswick, 1992). — 17. GRMEK, M. D., Gesnerus, 52 (1995) 7. — 18.GRMEK, M. D., Rad JAZU, 384 (1980) 57. — 19. GRMEK, M. D., Symposium Ciba, 7 (1959) 30. — 20. GRMEK, M. D.: Diseases at the beginning of the western civilization. In Croat. (Globus, Zagreb, 1989). — 21. GRMEK, M. D.: Les maladies dans l'art antique. (Fayard, Paris, 1998). — 22. GRMEK, M. D., Hist. Phil. Life Sci., 15 (1993) 281. — 23. GRMEK, M. D.: History of AIDS: Emergence and origin of a modern pandemic. (Princeton University Press, Princeton, 1990). — 24. GRMEK, M. D., Revue Administrative, 47 (1994) 488. — 25. GRMEK, M. D., Croat. Med. J., 35 (1994) 12. — 26. GRMEK, M. D., Period. Biol., 100 (1998) 411. — 27. GRMEK, M. D., Politique internationale, 55 (1992) 67. — 28. GRMEK, M. D.: Les cahiers de paix, L'Europe Centrale dans l'Après-communisme'. Conference du 27 avril 1992. (Verdun, 1993). — 29. GRMEK, M. D., Le role de l'histoire mythique dans les revendications nationales des Croates et des Serbes. In: De Russie et d'ailleurs. Feux croisés sur l'histoire (Mélanges Marc Ferro). (Institut d'études slaves, Paris 1995). — 30. GRMEK, M. D., M. GJIDARA, N. ŠIMAC: Ethnic cleansing. Historical documents about one Serbian ideology. (Globus, Zagreb, 1993).

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MIRKO DRAŽEN GRMEK: GENEZA ZNANSTVENE ČINJENICE I ARHEOLOGIJA BOLESTI

S A Ž E T A K

Profesor Mirko Dražen Grmek (1924–2000) jedan je od najprominentnijih hrvatskih znanstvenika. Proučavanje povijesti znanosti usmjerilo ga je prema interdisciplinarnosti, a njegov je pristup istraživanju uvelike bio antropološki. Bez pretenzija iscrpnosti, prikazati ćemo osnovne Grmekove teorije na primjerima dvaju modela. Iznijeti ćemo Grmekov pristup rekonstrukciji znanstvenog otkrića (uglavnom na primjerima iz 17. stoljeća), i njegov koncept bolesti. U okviru Grmekovog angažmana tijekom agresije na Hrvatsku spomenuto je uvođenje termina »memoricid«.