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Magnesia Research on Treatments for the De-Acidification of Info-Documentary Collections from Libraries, Archives and Museums: Case Studies

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The scientific concern of the authors is part of the project entitled: “The research, testing and using in the laboratory of natural products presenting significant impacts for de-acidification of paper collections”, an ambitious, original scientific project with perspective steps in ecological development and application of technological, clean lines, about the info-documents de-acidification for paper from libraries, museums and archives. Testing the natural products in pure chemical structures or composite structure (structure-blending) and obtaining of the stable chemical formula of the product is the first phase of the project which will check several products with destabilizing effects of hydrogen ions in the structure of the paper.

Keywords: *de-acidification of collections; magnesia; paper acidity; Magnesia test (magnesium oxide)*

1. General aspects. Purpose. Objectives

1.1 General aspects

The usage of new wide-spread de-acidification methods of info-documentary collections represents a very fresh scientific concern, due to the massive loss of info-documents from the great libraries, archives and museums around the world.

The irreversible effects of the acidity on the information-carrier organic supports are considered as being the most destructive and complex processes of degradation because the “paper cancer” acts in time with cumulated and irreversible effects.

The losses are immense due to the fact that there are no constant preoccupations in the great libraries regarding the monitoring of the pH evolution in the case of info-documents, by the help of the modern PH-meters, as well as of the preventive and curative interventions of mass de-acidification and the reinforcement techniques (consolidation-strengthening) of the treated info-documents.

For this reason, viable programmes appeared in the great libraries around the world regarding the salvation of the written values on organic support, the specialists in conservation receiving financial resources, high-capacity de-acidification equipment and conservation laboratories endowed with modern monitoring and intervention techniques.

The usage of the de-acidification methods, within the great libraries of the civilized world, represents the roughest preventive intervention, considered by the specialists in conservation “a necessary evil” for the neutralisation of the incipient forms and/or developed by the acidity on the information-carrier organic supports.

The safest way to slow down and block the appearance of the acidity in the info-document collections consists in: the removal of the acid processing system of the paper; the usage of the common equipment for air conditioning in museums, libraries and archives; avoidance of pollutant agents and their monitoring; the usage of some polymers for the protection of mechanical and cellulosic pastes within the process of colour reversion induced by light; avoidance of using optical bleachers when producing sustainable paper; surface treatment with starch and casein solutions; introduction of some buffering substances into the paper to decrease the influence of the oxygen in the microclimate of library, archive and museum; treatment of paper with non-volatile antiseptics for the induction of resistance to the attack of cellulolytic micro-organisms, as well as of the paper fauna; the cautious usage of ionizing radiations; the usage of modified cellulose types (with graft groups) or of the synthetic fibres when producing paper.

For the removal of the acidification sources of the info-cultural goods, due to the acid environment used in the paper producing processes or by the installation and activation of biological agents specific for the organic supports, the neutral/alkaline system with *alkyl ketene dimer (AKD)* and *alkenil succinic anhydride (ASA)* is largely used for paper sizing. The method of paper sizing and the usage of neutral-alkaline system were introduced in Romania since 1994, removing thus, the main cause regarding the acid environment in the paper producing processes, as well as in the conservation process of info-documentary collections.

For an appropriate approach of the pre-acidification, acidification and post-acidification processes of the info-documentary collections, it is necessary to present the *two systems of classification of the factors that induce the acidification of info-documentary collections*.

A first classification of causes that can cause the acidification of these goods, divides the causes into two main groups:

- *group of internal and endogenous factors* - that is specific to the paper chemistry, respectively the nature and quality of raw materials and technological conditions of production
- *group of external or exogenous factors* that defines the influence of the library, archive, museum microclimate, but also of the environment in general (Anon, 2009).

It is worth mentioning that the endogenous and exogenous factors can mutually potentiate themselves, intensifying the activation of the destructive chemical reactions; they can easily become inhibiting-blocking factors of the acidification chemical reactions of the documents on organic support by the appropriate usage of a group as blocking factor for a category of endogenous or exogenous factors.

From the presentation of the analytical classification domain of the factors that induce the acidification of collections from libraries, museums and archives, it is inferred that the essence of installation and development of the well-known rod, also named in the specialty literature as the “*paper cancer*” consists in the decryption and control of the relationships between the chemistry of organic supports that are information-carriers and the abiotic microclimatic and biotic factors.

1.2 Purpose

The aging processes of the organic information carriers, as well as those of cellulose acidification and oxidation represent processes, sometimes inevitable, of complex degradation of the document collections from libraries, museums and archives that lead in time to the change in physical and chemical characteristics, respectively to the destruction process of the cellulose.

As a consequence, the aging of the organic information carriers under the form of information products represents the whole complex of destruction of the material support and information, due to the cumulated action of endogenous and exogenous factors that cause the following reactions: reactions of oxidation with the oxygen in the microclimate of the library, archive and museum; reactions of hydrolysis under the action of relative humidity in the air; reactions of acidification of the collections in the libraries, museums and archives, due to the action of the reaction factors (pollutants, humidity) as well as of the activation factors in the case of the acidification reactions of the documents on organic support (temperature, light).

Thus, the aging process of the collections on organic supports takes place in a highly acidic environment, being a natural irreversible and unavoidable process - in time all documents being deteriorated.

An instrument that is already used for many years in the great western libraries is represented by the implementation of some programmes regarding the de-acidification treatments of the collections on organic support. There are intervention techniques, well-known in the practice of collection conservation on organic support, methods that through the test made in the research laboratories, checked the safety and efficiency of the chemical mechanisms of dislocation of the hydrogen ions from the structure of the material supports that are information carriers.

From the classical method of washing the documents with a very acid pH (<5) cumulated on a very long period of time and in precarious conservation conditions, to the modern methods by the conditioning and application of alkaline solutions under the form of spray or other modern physical-chemical methods, of accelerating the effects of chemical products used in the treatments by using the electromagnetic waves produced by a mobile device, are some of the well-known methods in the practice of applying de-acidification treatments of the collections on organic support.

The lack of national, regional and local programmes, supported by appropriate technical logistics and financed with the resources necessary to optimize the whole working process were and remain the obstacles to extensively apply the de-acidification treatments of the collections on organic support in libraries, archives and museums.

1.3 Objectives

The main objectives that have been researched in the lab and tested in the practice of the collection conservation are highlighted punctually:

- research regarding the usage of the *Magnesia* product as an efficient method in the application of the de-acidification treatments of the collections from libraries, archives and museums;
- laboratory research regarding the elaboration and application of the experimental materials and methods to test different concentrations of the *Magnesia* (2%, 1.5%, 1 %, 0.5%); case studies in laboratory conditions;
- research regarding the determination of the pH by the method of surface sampling - elaboration and application of experimental materials and methods for the determination of the paper acidity by using the pH-meter NORONIX PHT 140; drawing the evolution histograms of pH readings;

undertaking statistic calculus;

- research regarding the usage of the method by washing the acid documents in special laboratory basins by using the *Magnesia* product, finely grinded, dissolved in distilled water; establishment of the maintaining times of the documents in the reaction environment;

- research, elaboration and application of the synthesis indices used in the de-acidification treatments by washing the info-documentary collections from libraries, museums and archives;

- elaboration and presentation of the statistic analysis on the tested working variants in the experimental materials and methods;

- characterization of the washing methods in distilled water and magnesia of the highly-acidic documents, establishing the exposure time to the reaction environment; establishing the drying time of the treated documents; checking the physical, mechanical and chemical indices after treatment; conclusions; recommendations;

- research regarding the usage of electromagnetic waves in the de-acidification treatments of the collections from libraries, museums and archives treated with de-acidification products

production in the lab of the de-acidification products of the collections in libraries, museums and archives and capitalization of the products requested by the owners of cultural goods - physical and legal persons;

- elaboration of the de-acidification product technologies in safe and efficient conditions in the treatment applications.

2. Materials and Research Methods.

Elaboration and Presentation of the Experimental Materials and Methods

2.1 Materials

Magnesia product, a reagent for lab analysis, a non-harmful product according to EU legislation, was used to apply the de-acidification treatments to the info-documentary collections on paper in the laboratory.

Some specifications on magnesia, used as a de-acidification product, are presented: the product contains 99.5% magnesia; it is insoluble in the acetic acid 0.05%; it contains: chlorides 0.018%; sulphates 0.04%, heavy metals 0.003 %, arsenic 0.00004%; iron 0.069%; water solubility 0.28%. Other materials: distilled water with a pH of 6.9; special basin having a capacity of 10 l used for the preparation of the solution and application of the treatments by washing-immersion of the documents submitted to the de-acidification interventions; safety gloves, mask, and glasses; spraying device AS-2; ventilator.

The used infrastructure includes: pH-meter of Checker type, Hanna production, with electronic display for determining the pH of the reaction solution; pH-meter Noronix PHT 1140- for the acidity determinations of the documents before and after the de-acidification treatments; lens with led light - for symptomatologic observations; electronic balance Tanita, model No. 1475 - to weigh the magnesia and the preparation of the working variants; electric oven, model Memmert - for the usage of the electromagnetic waves as factor of activating the de-acidification reactions of the documents on organic support; electronic microscope, model Kruss (A Kruss Optronic) - for the microscopic analysis.

2.2 Research methods used for the determination of the pH by surface readings

2.2.1 For the determination of the pH in the case of the patrimony documents

It is recommended as the used methods to comply with the condition of maintaining the morphological integrity of the cultural good. As a consequence, the determination methods of the pH for the paper support that are classified information carriers must be non-invasive and non-destructive from a physical, mechanical and chemical point of view.

From the point of view of the investigation methods and/or non-invasive intervention, these procedures do not affect the morphological structure of the document physically, thus maintaining its integrity and the time patina (colour, glaze that is given to a cultural good with decorative purpose, to create the impression of aging or to protect it against the chemical corrosion or biological attack).

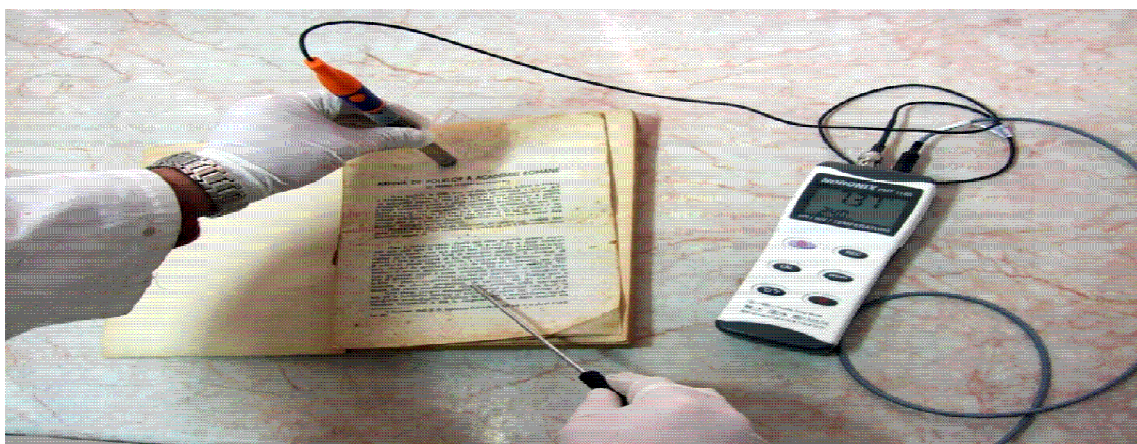


Photo 1. Advantages of surface readings having direct contact with the paper surface that is information-carrier, by using the pH-meter Noronix PHT 1140

- determinations of paper acidity with this equipment represents one of the few techniques agreed in the monitoring, storage and interpretation of the acidity for the info-documentary collections from libraries, museums and archives;
- the surface readings with this equipment are executed with a pH - meter with electrodes adapted technically to operate in a liquid environment;
- by placing the electrodes in contact with a drop of distilled water on the paper surface, an aqueous mini environment is formed wherein the electrodes act through direct contact;
- by using this modern equipment, the measurement device of the hydrogen ion concentration in the paper can be logged into a PC to capture on-line data regarding the values of pH/mV;
- the records of pH/mV or temperature can be saved in documentary files and the data can be used in different analyses: operational analyses; the evolution statistics of pH readings and temperature; display of more documents on the monitor functions adapted by choice; drawing the histograms (diagrams) of pH and temperature;
- the keying of the portable station with the contact electrode in solution with a standard pH (pH 4, Ph 7, pH 10), by accessing the commands in an integrated electronic system removes the measurement errors up to the standard values agreed by the institutions authorised in the standardization of the measurement operations of the acidity for the information-carrier organic supports;
- pH-meter Noronix PHT 1140 is foreseen with the following endowments: mobile station with contact electrode for the measurement of the temperature ($^{\circ}\text{C}/^{\circ}\text{F}$); software RS232 for the storage and processing of on-line data.



Photo 2. *Determination of pH in liquid solutions - elaboration of working methodology on the use of Hanna pH meter with electronic display*

The acidity determinations of the solution before and after the documents' washing in liquid reaction environments were made with the pH-meter Hanna, with electronic display. The first step consists in the removal of the safety helmet of the station and the attachment of the electrode to the measurement device.

Furthermore, the rod of the electrode is introduced in the liquid sample (distilled water with pH 7, before and after the immersion washing of the documents) prepared in a laboratory test tube. The content of the test tube is slightly shaken. The electronic display system is opened and the display equalization is waited for, after which the pH indicated on the monitor is read.

If a different test is needed, the washing (rinsing) of the electrode in distilled water is necessary to minimise the chemical contamination.

2.3 Elaboration and presentation of the experimental materials and methods for making the research regarding the usage of the magnesia in the de-acidification treatments of the collections from libraries, archives and museums

From a scientific point of view, the presentation and application of the scientific methods and materials represent essential stages for the whole working process through which the scientific research instruments are established, adapted to the objectives had in view for the usage of the experiences and experimental variants for the acquisition of the scientific data; determination of synthesis indices used in the scientific process; storage and processing of data; elaboration of scientific programmes; elaboration of synthesis, conclusions and recommendations (*Table 1*).

Crt. no.	Experiment specification	Research variants	Average values of pH	Number of repetitions - number of readings pH	Obs.
1.	<i>Exp.1. Research regarding the usage of magnesium oxide 2% in the de-acidification treatments of info-documents</i>	V1. Control sample. Average pH value in the untreated document	4.4	502	
		V2. Average pH value in the document treated with magnesia 2%	7.7	502	
2.	<i>Exp.2. Research regarding the usage of magnesia 1.5% in the de-acidification treatments of the info-documents</i>	V1. Control sample. Average pH value in the untreated document	5.2	504	
		V2. Average pH value in the document treated with magnesia 1.5%	8.1	502	
3.	<i>Exp.3. Research regarding the usage of magnesia 1% in the de-acidification treatment of the info-documents</i>	V1. Control sample. Average pH value in the untreated document	5.2	502	
		V2. Average pH value in the document treated with magnesia 1%	8.5	502	
4.	<i>Exp.4. Research regarding the usage of magnesia 0.5% in the de-acidification treatments of the info-documents</i>	V1. Control sample. Average pH value in the untreated document	5.5	503	
		V2. Average pH value in the document treated with magnesia 0.5%	7.5	503	

Table 1. *The research methods and materials designed and applied for the accomplishment of research regarding the usage of magnesia in the de-acidification treatments of collections from libraries, archives and museums. “Gheorghe Șincai” County Library, Oradea, Bihor, Laboratory of conservation-research-2014 (original)*

2.3.1 Elaboration and presentation of the research methods and materials regarding the determination of the synthesis indices used in the application of the de-acidification treatments by washing the collections from libraries, archives and museums; specifications regarding the determination of indices

The elaborated synthesis indices represent the useful analytical and scientific instruments, especially in the research domains within which fields and sub-fields represented through the number and diversity of variants and working repetitions.

In the case of the research undertaken in the Laboratory of conservation-research of the “Gheorghe Șincai”, County Library, Oradea, Bihor, the application of the complex experimental materials and methods through the number and essence of variants and used working repetitions, represented a challenge for the storage, processing, interpretation and capitalization of the obtained scientific results.

The presence of the synthesis indices used as viable instruments in our scientific working process was necessary, so that the experimental results obtained on variants and working repetitions to be quantified.

Some technical calculus aspects for the main identified and analyzed indices in Table 2 have been highlighted, each index used in the de-acidification treatments of the collections being presented into details.

- a. *Index of neutralisation (IN) (pH units)* represents the difference between the pH obtained by applying the treatment and the pH of the untreated document;
- b. *Initial weight of the untreated documents (G.i.d.)*, as well as the *final weight of the treated document (G.f.d.)* are indices that are obtained by weighing the document before and after the application of the treatment;
- c. *Content in solution of the treated documents (CS) (g/document)* represents the difference between the final weight of the treated document at a certain environmental temperature and at a certain time range that is rigorously established and the initial weight of the untreated document (see Table 2);
- d. *Some useful observations are made for the paper absorption index (IPA - %/document)* regarding its determination by using as calculus structure the indices in Table 2.

The calculus formula is:

$$IPA = \frac{100 \times CS}{100 - CS}, \text{ where CS represents the content in solution of the treated document}$$

By replacing it with the value in Table 2, it is achieved:

$$IPA = \frac{100 \times 3}{100 - 3} = \frac{300}{97} = 3,09\%$$

- e. *Total capacity of absorption (CTA - g/document)* is obtained by multiplying the solution content of the treated documents with the initial weight of the untreated document

In a first phase of research, these indices are used for all the preventive humid treatments. They represent a major subject for the domain research, being convinced by the usefulness of the further working processes undertaken by the Laboratory of conservation-research from “Gheorghe Șincai” County Library, Oradea.

Crt. no.	Product used and concentration	Research variants		Neutralisation index (IN) (pH units)	Initial weight of the document G.i.d. (g)	Final weight of the treated document G.f.d. (g)	Solution content CS (g/doc.)	Paper absorption index IPA (%/doc)	Total capacity of absorption (g/doc.)	Obs.
		pH V ₁ untreated - control- (pH units)	pH V ₂ treated (pH units)							
1	2	3	4	5(4-3)	6	7	8(7-6)	9	10 (8×6)	
1.	Magnesia 2%	4.4	7.7	3.3	166	169	3.0	3.09	512.94	
2.	Magnesia 1.5%	5.2	8.1	2.9	646	648	2.0	2.04	1 317.84	
3.	Magnesia 1%	5.2	8.5	3.3	133	135	2.0	2.04	266	
4.	Magnesia 0.5%	5.5	7.5	2.0	174	176	2.0	2.04	348	

Table 2. *Research procedure elaborated and applied for the determination of the synthesis indices used in the application of de-acidification treatments for the info-documentary collections in libraries, archives and museums (according to V.A. Deac, 2014)*

3. Scientific results. Discussion

3.1 Specifications on the usage of the magnesia prepared and used as analysis reagent

The magnesia (MgO) is a formless, white powder with a slightly alkaline taste, with features useful in the protection of info-documents on organic support in the libraries, archives and museums, being an efficient and promising absorbent and anti-acid protector, with some weak anaesthetic, surface effects, that disturbs the development of the biological cycle in the case of fungi and cellulolytic bacteria, as well as of the paper and xylophages insects.

The test made in the Laboratory of conservation-research from “Gheorghe Șincai County Library, Oradea, Bihor, on lab samples from suspensions that contain colloidal bentonite and magnesia highlighted the beneficial anti-acid effects on information-carrier organic supports that were strongly acidified in time.

Other set of laboratory studies, undertaken before our final working process, highlighted the neutralising capacity of the paper acidity, quality tested in the laboratory by washing the strongly acid documents in solution made up of distilled water and magnesia prepared and used as analysis reagent.

The determinations made in the laboratory on the usage of magnesia prepared as analysis reagent present a special importance in the elaboration and application of de-acidification treatments in the case of info-documentary collections from libraries, archives and museums for the following reasons:

- magnesia prepared and used as analysis reagent is soluble in water and acids, having a strong neutralising and absorbing mechanism;
- this product can increase the pH of the info-documents in the libraries, archives and museums up to 9 units pH;
- magnesia presents anti-acid features proved in the laboratory having a significant capacity of neutralisation of the hyper-acidity in the case of the info-documents that are highly-affected by the exogenous and endogenous abiotic and/or biotic disturbances;
- treatments of the very acidic documents, by their washing through immersion in an environment made up of magnesia, neutralises the acidity of the treated documents with at least 3-5 units pH;
- the laboratory tests proved that the buffering agent is uniformly distributed on the morphological components of the treated document by washing, through its controlled immersion in the solution rigorously prepared;
- the product doesn't affect the integrity of the inks and doesn't degrade the adhesives and other components of the books or their bindings, as long as the immersion of the documents in the de-acidification solution is controlled to avoid some accidents regarding the morphological and information stability of the treated documents;
- by the usage of the magnesia under the form of analysis reagent, the finally obtained pH can range from 7 to 10 normal values and is usually located on the range 8-9.5; On this range of values, there are no risks of alkaline hydrolysis, because the maximum is ensured close to the risk limit for the initiation of the alkaline hydrolysis;
- the product tested in the Laboratory of conservation-research from “Gheorghe Șincai” County Library, Oradea, Bihor can be used without any reserve in the treatments on the de-acidification of the info-documents from libraries, archives and museums (books, manuscripts, archive registers, press, maps, documentary archive collections, other collections on paper support);

- after the application of this product in the laboratory, by using the controlled washing-immersion of the documents that are highly acidic, the mechanical resistance indices of the paper are not affected, there are no ridges or other deformations of the paper, but there is recorded a slowing down process of the degradation mechanisms by the control and blocking the chemical degradation;
- the magnesia product under the form of analysis reagent but also the reaction solution are not toxic for the health of the operators; they do not contain CFC and solvents;
- for the perspective research of the Laboratory of conservation-research from “Gheorghe Șincai” County Library, Oradea, Bihor, some modern solutions of processing the alkaline buffering product will be found to neutralize the paper acidity.

3.2 Experimental procedure

For the dissemination of the obtained scientific results it is necessary to present the experimental procedure used in the application of the neutralising treatments of the hyperacidity of the documents on organic support, with special references for two analytical structures: the presentation of the general experimental procedure that includes the general elements with macrostructural implications; presentations of the specific experimental procedure with special references on the variants, sub-variants and number of repetitions used for data sampling, used experimental technique and data sampling, storage and processing methodologies. Within the developed research, the experimental procedure represents the pattern necessary for the scientific process that coordinates all the activities made on experiences, variants and working repetitions.

This procedure is necessary to be presented into details for the multiplication of the research in other conditions of library, museum and archive according to a minimum of technical equipment that is necessary to make the treatments.

The experimental procedure will be considered a scientific one when the scientific results will be presented and the calculus methods will be applied by statistic techniques in order to establish efficient working variants in the application of the treatments for correcting the paper acidity.

3.3 Summary of the scientific results obtained on the elaborated and applied research procedure

The scientific results on the application of the magnesia in different concentrations were highlighted in Table 3.

Out of this table analysis, some precise and useful information can be obtained in the practice of library collections' conservation, representing a starting point in the new approaches on the de-acidification of library collection by using nano-particles of magnesia. The research designed and undertaken in Oradea are part of an ample research programme that has in view useful and affordable technical solutions for the practitioners.

Crt. no.	Research variant	pH of an untreated document - control sample				Ph of a treated document			
		Maximum value	Minimum value	Average value	Std. dev*	Maximum value	Minimum value	Average value	Std. dev
1.	Magnesia 2%	6.0	3.9	4.4	0.4	8.2	6.9	7.7	0.4
2.	Magnesia 1.5%	6.1	4.7	5.2	0.4	8.6	7.8	8.1	0.1
3.	Magnesia 1.0%	5.9	4.8	5.2	0.3	8.9	8.4	8.5	0.1
4.	Magnesia 0.5%	6.0	5.3	5.5	0.2	8.1	7.1	7.5	0.3

* standard deviation of the pH-meter (std.dev) highlighted by the statistic calculus

Table 3. *Summary regarding the synthesis of the research undertaken for the usage of the magnesia (2%;1.5%; 1.0%;0.5%) in the de-acidification treatments of the collections from libraries, museums and archives (“Gheorghe Șincai” County Library Bihor, Oradea - Laboratory of conservation-research 2013-2015)*

The laboratory research made at “Gheorghe Șincai” County Library, Oradea proved that the magnesia product in the researched concentrations represents an efficient solution for the neutralisation acidity of the paper for all the library documents, as it follows:

- bound documents (books, magazines) can be treated by washing them with solution page after page and in the case of very high acidic values (under 5), the immersion in special basins is recommended;
- for press and other documents that are not bound, the treatments with this product can be made by applying a spray solution;
- for the interventions made on the patrimony documents, the laboratory tests made in Oradea with this product highlighted its efficiency in neutralising the acidity spots under the form of individual or united glomeruli (aggregates of variable sizes, formed by the agglutination of hydrogen particles from the cellulolytic structure of paper).

The paper acidity spots as well as the action of the magnesia have been highlighted in the photos below.



Photo 3. *Paper acidity spot under the lens of the laboratory researchers*

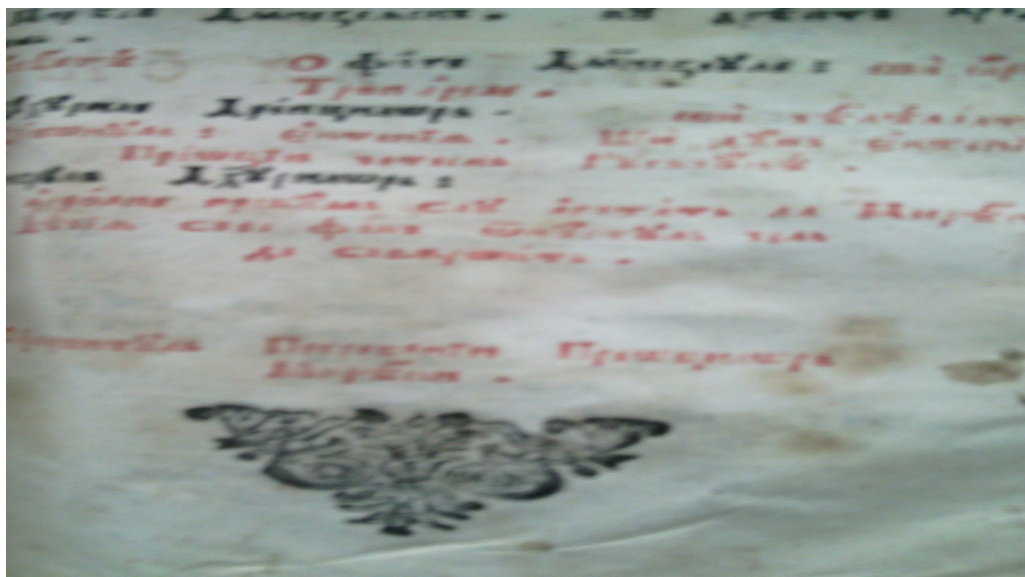
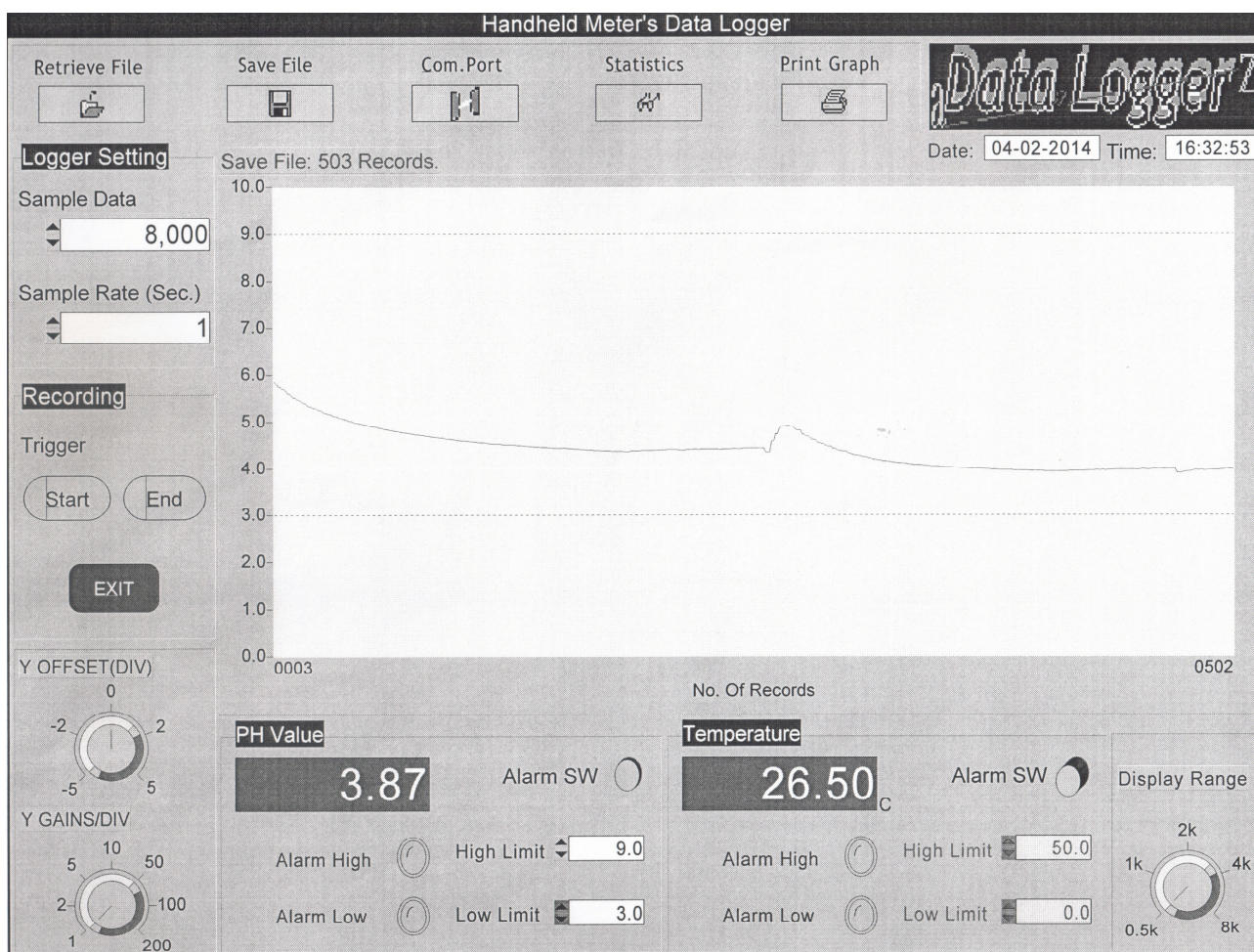


Photo 4. Final effect of the magnesia in neutralizing the acidity spots

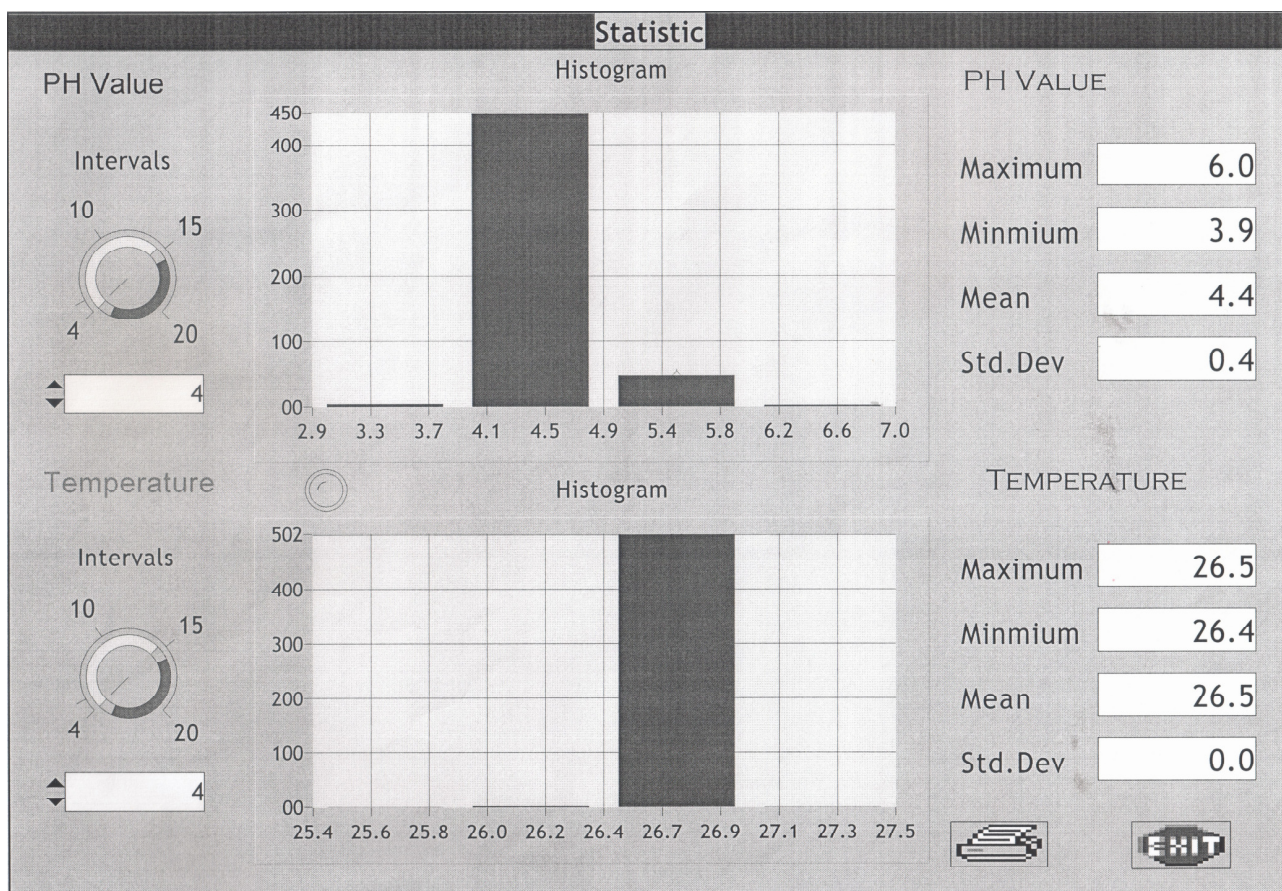
ANNEX 1

Determination of paper acidity by using pH-meter NORONIX for control variant (before the treatment with magnesia 2%)



ANNEX 2

Statistic calculus for the researched variant: presentation of histogram, as well as of maximum, minimum and average values of the pH for control variant (before the treatment with magnesia 2%)



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The Librarian - A Redefined Profession for the 21st Century

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The digital environment and related technologies transform the professions in the fields of Library and Information Sciences. The article tries to present the specificity of the librarianship professions in this new informational and communication context and to identify the skills and competences needed to effectively carry out specific activities in the digital age. The profession of librarian has undergone a spectacular transformation into one of the most complex professions. If for a long time it has been regarded as a humanist profession, it has been seen in the last few decades that we are finding it more and more as a socio-technical profession that necessarily requires library and information science, communication, ICT, foreign languages as well as solid general knowledge of various fields. The profession of librarian is a profession of socio-human and technical synthesis.

Keywords: *librarianship; competencies; qualifications*

1. History

Library has always been a social institution with different faces depending on the level of development of the society, on information circulation, and on the level of education of the information. The library of the Antiquity operated within temples and royal palaces and it was a symbol of social standing: a kingdom, a community were appreciated for their documentary collections and for the prestige of their scholars. Quite often, a written document had a sacred connotation and librarians were considered scholars.

During the middle Ages, they preserved and developed scholarly traditions and libraries function mainly within monasteries: their role was not only to keep documents, but also to copy manuscripts in the famous scriptoria, which saved part of the antique heritage. Librarians has the reputation of scientists or researchers.

During the Renaissance and the modern times, libraries as institutions reflected both society and community. The press had a decisive contribution to book availability, which resulted in a larger number of libraries with a wide variety of activities: national libraries, public libraries. Thus, access to culture and education is being democratized. Academic prestige is related to university libraries. Librarians become document specialists aiming at organizing and managing documentary funds, and ensuring access to these funds.

2. Current Context

The 21st century has brought about a revolution of traditional models of information and documenting: a wide range of changes within a short time, relatively difficult to understand by libraries, changes that force libraries to continuously adapt to the challenges of a changing society where information plays a determining role. Library as an institution has undergone an identity crisis: it is in a complementary or even competitive relationship with Internet.

Libraries are not autonomous institutions: they are part of a social, educational, administrative, cultural subsystem that reflects all the changes in these fields (Rey, 2010). Therefore, an analysis or an evaluation of libraries can be done only if we take into account the context in which they operate. The context can be social, administrative, cultural, economic, or circumscribed to Information and Communication Technologies (ICTs). ICTs have brought unprecedented changes in libraries and their activities, thus changing librarianship and information professions.

Digital information and documentary resources purchased by libraries (most often as access licences) relieve institutions from specific activities such as traditional purchase, recording, cataloguing, indexing, etc., but they also bring about new activities and attributions. *Libraries and librarians develop access and evaluation of information resources competencies, of user education to acquire information culture, of achieving information and knowledge management.*

3. National Referential Framework of Document and Information Professions

In a context in which there is an ongoing debate on the status, place, and role of libraries in society, it is necessary to develop a national referential framework of the professions in Library and Information Science. The concern for this profession shows its social importance in a society determined and conditioned by information, where it should rank first.

A good example in this respect is France, where there are national referential frameworks for all professions. For library, information, and documenting professions, there are very developed and diversified referential frameworks per categories of institutions, per specialisations or simply theoretical ones developed by universities, professional associations aiming at consolidating professions and at ensuring proper professional training and integration in the professional and social environment of the professionals in the field (Marcerou-Ramel, 2017).

For Romania, a national referential framework of professions in Library and Information Science should also equally be:

- An inventory of professions in Library and Information Science correlated with the professions in the *Classification of Trades in Romania (CTR)* (updated with certain necessary corrections such as redefinitions of some professions, addition of new professions), a mission of professional associations and of academic specialisations;
- A descriptive referential framework for each profession necessary for the development of the specialisation sheet, the record of the profession, or of the job description;
- A referential framework of the ways and tools allowing professional licensing and evaluation (basic professional training ways, academic specialisations and continuous education, as well as an inventory of the tools allowing the acquisition of knowledge, abilities, professional practice, etc.).

Such a national referential framework should cover professions grouped per classes and categories and that represent the main activities and responsibilities of an information and documenting structure, and a concrete representation of this professional document would include:

- The occupational standard of the profession;
- A typology of the professions;
- The competencies necessary to each profession;
- The level of professional training for each profession;
- The record of the profession or the generic job description.

All these information could define a specific professional category at national level because it would reveal the types of Library and Information Science professions in our information and documenting structures (and in other institutions and organisations operating with information) in

Romania; for each profession, we could define the necessary competencies, the forms of professional training and the required qualifications, the criteria and ways of professional evaluation; at national level, we could evaluate the evolution of the profession and corroborate the demands of the labour market and academic training both quantitatively and qualitatively.

The Occupational Standard for the trade of Librarian with higher education in Romania was developed because we needed to define the required competencies in basic and continuous professional training. The National Library of Romania sent to the Ministry of Labour, in 2012, the occupational standard for library professions. The standard was developed as a result of the development of occupational analysis for the trade Librarian (with higher education), *basic group 2622 Librarians and specialists in other information services, code COR 262202* (Autoritatea Națională pentru Calificări, 2012). This is the first version of the standard, with possible renewal of the contents every four years.

The occupational standard identifies the specific activities and competencies of library professions and somehow manages to define what a librarian is in Romania. Thus, according to the standard, a *Librarian with higher education* is a specialist in charge of organising an information and documenting structure and its information and documentary content, as well as of ensuring the access to information and documents for all types of beneficiaries. The trade is in continuous change and reconfiguration as a result of the evolution and spread of ICTs and of the evolution of human knowledge and of the diversification of the way the latter are represented. *Librarians with higher education* work within national, county, town, commune libraries, in specialised, academic, school, etc. libraries, in information and documenting centres, as well as librarian or specialist in information in different institutions.

To access the profession, one needs three categories of competencies named *Titles and categories of competence units* covering professional competencies and abilities, transversal competencies and general knowledge competencies - eight competence units (communication abilities, foreign language skills, basic competencies in mathematics, science and technology, information skills, ability to learn, social and civic competencies, entrepreneurial competencies, cultural competencies; general competencies - three competence units (organising one's own activity, observing legal stipulations regarding labour health and security and emergency situation security, observing environmental protection rules); specific professional competencies - eleven units of competence (information management of documents in libraries, management of documents specific to library activities, developing collections of documents, recording non-periodical documents, recording periodicals, processing document collections, preventive conservation of document collections, communicating document collections, recovering information, guiding staff from territorial structures, managing relations with beneficiaries). We need to say that the standard does not advance a unit of specific competencies for digital resources because they considered that ICTs are present in all library activities and, therefore, the competencies required by digital documents and their specific processes can be integrated in the other specific units.

For each unit of general or specific competencies, they establish the Level of responsibility and autonomy, Elements of competence, Criteria for the achievement associated with the result of the activity described by the competence element, Criteria of achievement associated with the implementing of the activity described by the competence element, and Context (Variable range, Knowledge).

The Typology of Professions in Library and Information Science is dynamic because they are increasingly diversified and complex, different in expression and content from the ones in the 20th century and, in addition, new professions specific to the digital environment. The profession of librarian is a polyvalent profession including trades strictly related to the document and information such as cataloguer, indexer, bibliographer, editor, conservator, librarian with attributions strictly linked to library processes and also trades needing transversal competencies or competencies common to other professions such as researcher, manager with different

responsibilities, engineer, computer specialist, mediator of information, etc. (Rey, 2010).

The National High School of Information Science and Libraries (*Ecole Nationale Supérieure des Sciences de l'Information et des Bibliothèques*), the most prestigious academic school in the field of Library and Information Science in France, developed a referential framework of the field including the new professions associated with information and document (ENSSIB, s.a.). Besides the fact that this referential framework could be a good model for the Romanian area, it is important to note that the new professions of information and document are not necessarily found in information and documenting structures: they can be found in absolutely any field of activity using information and needing activities and processes of organizing, identifying and using information. Such examples of new trades could be information broker, data and information architect, data analyst, site administrator, data and digital information manager, database administrator, knowledge manager, etc.

Specific competencies state the ability of a profession to understand and accomplish as well as possible the activities and processes involved. A competence is new in relation to the ensemble of competencies operating at some point in a profession if describing an attribution not exercised until then. When, in a profession, most competencies are new and operate in a professional context that is new or different from the common one, then we have a new profession.

The occupational standard *Librarian with higher education degree* describes quite in detail the competencies and qualifications needed for a person wishing to work in a Romanian information and documenting structure. It stipulates the competencies and aptitudes necessary for all library activities and processes and the general competencies related with different categories of people, effective oral and written communication, research, analysis and synthesis, assimilation of an important amount of information, management of diverse professional situations, flexibility, opening, and resistance to sustained intellectual effort. Access conditions are related to solid knowledge culture, foreign language skills, and computer skills (Autoritatea Națională pentru Calificări, 2012).

The most demanding and frequent new competencies are determined by the digital environment and the use of ICTs. Thus, there are computer competencies (information systems, databases and different applications); competencies in organising and recovering digital information, competencies related to the understanding of the legal and economic contexts accompanying the information (intellectual property rights, access rights, etc.).

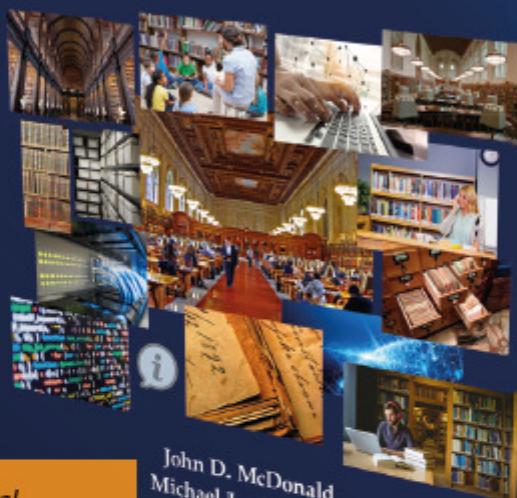
Digital products and services force librarians and specialists in information science to acquire specific competencies. At international level, to practice information trades, one needs such basic competencies as competencies in basic training, ICTs competencies, specific managerial competencies (document management, information management, and knowledge management), competencies in an expertise field (specialisation in the profession), and communication competencies (Nonthacumjane, 2011). These competence categories show the complexity of the profession under the influence of the digital environment and of increasingly demanding users. Equally important are complementary competencies such a linguistic competencies, public communication competencies, team work competencies, project management and coordination competencies, as well as leadership abilities, attachment for the profession, flexibility, etc. (Ferret and Marcinek, 1999).

Professional training, training in a profession is closely related to the abilities and competencies of the profession. Professional training needs to keep up with the evolution of library and information science. First, the influence of ICTs changes and diversifies professional competencies resulting even in hyper-specialisations per activities or types of documents (e.g., in France, there are library professions of a certain level of specialization that can be practiced only by doctors in the field) (Jung, 2013). Second, the new trades of information and documenting are found not only in information and documenting structures but in absolutely any field of activity using information

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Fourth Edition



John D. McDonald
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and needing activities and processes of organization, recovery and use of information. We thus witness an extension of the labour market for the graduates from Library and Information Science.

Professional training can be achieved in two ways: academic and continuous education.

Academic training is achieved in Romania as in other European Union through three education cycles: 1st - bachelor; 2nd - Master; 3rd - Doctorate. Bachelor is the basic academic training and Master and Doctorate are specialisations in the field.

Continuous training has become essential for library professions: they address people employed on the labour market and representing the way of facing the dynamics of information and the extraordinary evolution of associated trades.

To ensure the competencies needed by the professions on the labour market, we need a permanent link between professional associations and the institutions ensuring academic training or continuous education to define the proper curricula per categories and types of library professions.

The standard profession sheet or the generic job description should include (according to ADBS, 2007):

Name (it can be generic, e.g., *Librarian*, or assimilated names, e.g., Information and documenting system administrator, Database administrator, Digital content administrator, Specific application administrator, Information interface responsible, etc.). Such a name should be identifiable by its name precisely and without confusion;

Mission, basic responsibility (executive or leading positions, place in the organisational chart);

Professional evolution (professional steps and conditions for the promotion);

Necessary qualification level per professional level (medium or academic basic studies, specialisations such as Master or Doctorate, complementary qualifications);

Specific activities (detailed for each professional step);

Required competencies and aptitudes (basic competencies, complementary and transversal, personal);

Working context (relations within the organisational chart, interaction with other services or organizational structures);

Professional mobility (which professions could replace library and information science professions).

The standard professional sheet proves useful in the statement of the professional training requirements by licensed trainers in defining access requirements and in ensuring criteria and requirements of objective evaluation.

4. Conclusions

The trade of librarian has undergone spectacular changes becoming one of the most complex professions. If it has long been seen as a humane profession, the last decades have shown it is seen more and more as a socio-technical profession since it needs mandatory library and information science competencies, communication competencies, computer skills, language skills, as well as general knowledge from the most diverse fields. *The trade of librarian is a socio-humane and technical synthesis trade.*

We see, nowadays, an incontestable transformation of the professions related to document and information. Consecrated professions have undergone deep changes turning into extremely narrow specialisations for certain activities. Basic library activities need technological competencies and, in addition, new professions have emerged.

Profession changes determine the need to train proper competencies, most of which are new competencies related to the digital environment. Transversal competencies are equally important in practicing a trade (such as basic competencies that are the core of professional activities).

Professional training needs to be a real symbiosis between theoretical development and real demands of the labour market; we also need cooperation between professional associations and trainers. Access to the profession is not possible without proper training. The human factor, professional competence play a determining role in the social success of information and documenting structures.

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Niniveh and Alexandria: The Two Vanished Libraries of Antiquity

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Humankind has dramatically evolved for the past thousands of years in terms of communication - starting from signs and signals conveyed via visual and auditory means and ending up with the set of signs that came to be known as the alphabet over a vast geographic area. For example, the Sumerian tablets created in Uruk were initially destined for commercial purposes and it was only afterwards that they were viewed as including knowledge of their time. Another example of historical evolution is the Egyptian papyruses gathered in Alexandria in the greatest building of the ancient world's library. Nowadays there are only few such remnants, but their importance for how writing has evolved is invaluable.

Keywords: *library; papyrus; tablets; general catalogue; inventory*

1. Introduction

For the people of the XXI century, access to technology has become a habit. Thus, consulting information via the Internet, rapid communication through socialization networks, access to digital libraries, or instant texting are some of our daily activities and it is more than normal to consider them as a sign of evolution. Nonetheless, such means of writing and communication among communities have taken years of creation and refining.

Social communication has been one of humans' main features for thousands of years. As Erich (2008, p. 5) states, "In the beginning, the knots on the string, the sticks or stones of various shapes and sizes expressed in a material form the word. Subsequently, people have discovered the visual art of rendering the oral word with the help of the figure or beings to which it refers" [1]. Therefore, the forms of communication are different and have evolved over time - starting with acoustic and vocal signs, moving on to the tally system or to objects strung on a rope, the first letters that are precursors of the alphabet and ending with the use of the Internet and communication via emails.

Books are the tell tale of how valuable an author is and also of a community. Books as commodity used to be highly expensive and their value was measured in cattle or land - which were the exchange means for communities in the Ancient world and the Middle Ages. Writing and reading skills were only acquired by initiated people in Antiquity and then by aristocracy in the Middle Ages. It is only with modern times that they have become part of mass culture as a result of state involvement in establishing elementary schools. In this respect, our article focuses on two great libraries of Antiquity that used to be emblematic for the Mediterranean area given the latter's development generated by the commerce with merchandise, slaves and texts.

2. The history of the Assyrian library

The Ancient East was the cradle of the oldest civilizations and the fit area for state crystallization.

Kingdoms and empires like Sumer, Assyria, Babylon and Egypt emerged between the Tigris and Euphrates, and on the banks of the Ganges or the Nile. The state was supported by well organized political and administrative systems along with well paid armies. With the prosperity of economies and state expansion the concern for the arts also emerged. The priests were the ones guarding spiritual life and faith in gods - important coordinates that managed to keep population under the control of political power. Writing emerged as a result of priests' and kings' concern for it and was honed through penmen's hard work. Initially it was but a small number of signs destined for a small group of people that afterwards spread over large areas. Writing on soft clay tablets or papyrus was part of the Mesopotamian and Egyptian cultures and these were the foundation for the most well known library during the Antiquity, namely the one raised in Niniveh.

Traces of Sumerian writings were identified in the old Lagaš in 1877 when statues and old writings were discovered. The oldest writings were no different from the pictographs of the previous age and they represented the foundation for Sumerian writing. The Sumerian vocabulary was characteristic of an agglutinative language - impressions of straight lines or circles on soft clay were made using reed or wooden stylus. Penmen were the ones who created the clay tablets and their cuneiform writing was only known by a group of initiates.

The library was established by the Neo Assyrian King Ashurbanipal - a man of vision since he gathered the scholars of his time in his court. The latter copied manuscripts from different areas of the empire, including Babylonian, Greek and even Hebrew texts. Clay tablets were used for writing and the impression was made with a sharp tool (a stylus employed on the soft clay tablets that afterwards were burnt in ovens) that actually gave the name of the writing - cuneiform. The texts in the library inventory were old, dating back to the VII century B.C. and included the literary master piece of the East, namely the Epic of Gilgamesh, the most famous Babylonian creation, "a dramatic illustration of human condition defined by the impossibility to avoid death" [2] (Eliade, 1991, p. 87). The Epic of Gilgamesh was the greatest literary work of the time and it was written on twelve tablets. It describes the confrontation between a mortal and the powerful goddess Ishtar and the search for a cure for death. Another work in the library was the so-called *Venus Tablet* - a collection of astronomical texts and observations of Venus planet's movement for a 21 years time period.

The secondary information available today indicates that the inventory of this royal library contained 30,000 tablets and fragments at the time of its destruction. The texts on the tablets were of various sorts: administrative, legal, diplomatic, commercial, spiritual like prophecies, incantations, hymns to gods or synthetic works such as medical, astronomical treatises or even literary works. The library had more than twelve rooms and the tablets were thematically organized, while a small inventory was to be found in front of every room. All this was included in the general inventory of the library.

Most of the tablets in the library were destroyed in 612 B.C. by the Medes who came from the North of Mesopotamia and looted and then controlled the Assyrian kingdom.

The rest of tablets that survived fires and looting were discovered by a British archaeologist, Ansten Henry Layard, in the North of Mesopotamia, in Kouyunjik, close to nowadays' Mosul - Iraq. They were taken to London and they are exhibited in the British Museum.

3. The History of the Library in Alexandria

History provides numerous examples of personalities who conquered vast territories and were also cultivated people with a high esteem for art. A famous example in this respect is Alexander the Great, the young king of Macedonia who conquered most of Southern Europe and Central Asia and his armies even made it to India. He was a visionary and courageous king who founded the greatest empire ever known in history. During his childhood and teenage years he was a disciple of

Aristotle and of the Greek philosophy school. As a result, he learnt philosophy, acquired oratorical and analytical skills and mastered tolerance. These qualities helped him become a great leader and made him receptive to the culture of the peoples he encountered in the wars he waged.

The city of Alexandria was founded by Alexander the Great during his conquests in Egypt. He planned to build a great cultural establishment but he died young before accomplishing that. His plan was seen to fruition by the Pharaoh Ptolemy II Soter who established the library in 283 B.C. it was solid construction that was part of a city where all buildings were made of stone (a great effort considering the great distances from where stone was brought). The real library organizer was Demetrius, former governor of Athens, who had left the city for political reasons and chose to work for Ptolemy II. The latter offered him a peaceful life and tasked him with the complex activity of organizing the library. By the Pharaoh's order, many art lovers, philosophers, sculptors and cultivated people gathered around the Museion library in the city. Demetrius organized the library, its general catalogue and the catalogues for each section of the library. The papyri were thematically organized in separate rooms and they were inventoried in a catalogue to be found in front of every room.

The library hosted scribes who translated and copied texts from Greek and Hebrew as accurately as possible. The building of the library was extremely large for those times and hosted 700,000 volumes, study and conference rooms. The texts were written on papyrus and the latter was manufactured by the method employed in the 3rd millennium B.C. - the plant, similar to the reed, would be smashed in stalks and these would be sewn one to another resulting a piece of paper suitable for writing. Its length could even reach 12 m and it was rolled on bamboo sticks to make their preservation easier.

The poet Callimachus of Cyrene, who worked in the library of Alexandria elaborated the first methodical catalogue of the Greek writers, known by the name of *pinakes*. The latter provided information on writings and their circulation in the Mediterranean area.

The library was destroyed in two stages. During the civil war between Pompey and Caesar, the latter's troops burnt Alexandria and its library to the ground since Pompey had taken shelter in the city. At the end of the civil war, Caesar becomes the sole ruler and then Roman emperor. The final destruction of the library occurred during Caliph Umar's reign when Arabs reach Alexandria and during their looting burn the remaining papyri as heretic and contrary to the Quran.

4. Conclusions

The information on these two vanished libraries help us create an image. The Antiquity and the two states that were so much politically developed are images of a productive historical period. The works of Greek and Jewish writers circulated across a vast area and were brought by merchants or people paid by the kings to this end. The organization of the two libraries, their vast spaces, thematic rooms, and inventories for each room, as well as their general catalogues are tell tale signs of thorough and methodical work. They are also the result of considerable economic efforts that could only have been made by a stable and politically prosperous state. Scholars worked and studied quietly in Niniveh and Alexandria and it took them tens or hundreds of years to gather the libraries' collections of texts consisting of thousands of samples. History and the power of newcomers led to looting and burning the two wonders of the Ancient East. The partial information glimpsed from secondary sources and the few archaeological pieces that are still available nowadays make us conclude that the two libraries are representative for a time when writings were appreciated, used and stored in buildings destined to this end. The two ancient libraries are a starting point in the evolution of libraries. They are also landmarks and symbols for what buildings meant to host libraries should be like.

Notes

1. Romanian version: „La începuturi nodurile pe sfoară, bețișoarele sau pietrele de diverse forme și dimensiuni exprimau într-o formă materială cuvântul. Ulterior oamenii au descoperit arta vizuală de a reda cuvântul oral cu ajutorul figurii sau ființei la care se făcea referire”.
2. Romanian version: „O ilustrare dramatică a condiției urmane, definită prin inevitabilitatea morții”.

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