



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

HELLENIC REPUBLIC

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HELLENIC QUALITY ASSURANCE AGENCY

ΑΝΩΤΑΤΗΣ ΕΚΠΑΙΔΕΥΣΗΣ

FOR HIGHER EDUCATION

EXTERNAL EVALUATION REPORT

DEPARTMENT of **Chemistry, Aristotle University of Thessaloniki**

February, 2011

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External Evaluation Committee

The Committee responsible for the External Evaluation of the Department of Chemistry of the Aristotle University of Thessaloniki consisted of the following five (5) expert evaluators drawn from the Registry constituted by the HQAA in accordance with Law 3374/2005 :

1. Professor D. Coucouvanis, Chair
University of Michigan (USA)
2. Professor D. S. Argyropoulos,
North Carolina State University (USA)
3. Professor C. A. Floudas
Princeton University (USA)
4. Professor A. Giannis
University of Leipzig (Germany)
5. Professor G. Hadziioannou
University of Bordeaux (France)

Introduction

I. The External Evaluation Procedure

- Dates of the site visit

The visit was carried out from 10 am of 21/2/2011 up to 11 pm of 22/2/2011.

- Whom did the Committee meet?

Day 1, Monday, February 21, 2011:

At the beginning of the evaluation process the members of the external evaluation committee met with the vice rector and the rector of the Aristotle University of Thessaloniki (AUTH) and were exposed to a very general presentation of the intra and inter-departmental major research equipment acquisition situation, problems and future plans. In this meeting participated also Prof. Achilleas Papoutsis (Chairman of the Chemistry Department), Prof. Bakalmpassis, Prof. Matis (both members of internal evaluation group, OMEA). Prof. I. Gerothanassis from the HQAA was also present in this and all the other meetings during the evaluation process.

Upon completion of this short meeting, we visited the department in order to attend a general presentation of the research activities of AUTH by the dean of the Faculty of Natural Sciences. To our disappointment this meeting was interrupted violently by a group of students who represented a minority position against the Internal and External Evaluation process. In contrast to the position of this minority group, and to our satisfaction, a constructive discussion with a large group consisting of about 35-40 undergraduate and graduate students took place during the evening of the following day.

During the afternoon Prof. Papoutsis gave a talk and presented the history of the department, current research, teaching personnel and activities, infrastructure, facilities and financial situation including funding.

Prof. Zoumpoulis presented the curriculum of the Undergraduate studies whereas Prof. Koutouli-Argyropoulou and other members of the teaching staff presented the curriculum of graduate and interdepartmental studies. Prof. Varela and Prof. Stratis presented the Erasmus Program and other activities of the Department.

Day 2, Tuesday, February, 22, 2011:

General presentations of the research activities of the divisions of inorganic, organic chemistry and biochemistry, physical chemistry, analytical chemistry, environmental chemistry, chemical technology and biochemistry were offered by the group leaders.

All presentations were detailed and informative, questions were asked and problems discussed. All presentations were provided to the members of the external evaluation committee in printed form and as a CD-ROM.

During the last day we had the opportunity to briefly visit the departmental laboratories as well as the laboratories (general chemistry, inorganic chemistry, organic chemistry, physical chemistry, pollution and environmental chemistry, biochemistry, general and inorganic chemical technology, food chemistry and technology) and the computational laboratories. During these visits we conversed with the corresponding laboratory instructors and students. Finally, we visited the old fashioned and incompletely equipped library and talked with the librarian.

During the second day we had a constructive and open discussion with a group consisting of 35-40 masters, doctoral, and undergraduate students. This discussion took place in the absence of the department's professors and important insights were gained about the daily

life in the laboratories and the department overall. The students described their situation as desperate and expressed their major disappointment in regard to the access and quality of departmental experimental equipment and about their treatment from their professors. They complained bitterly about potentially disastrous laboratory safety measures and reported about almost non-existing funding. They also complained about the non-existing facility for construction and repair of scientific glass instruments.

Day 3, Wednesday 23, 2011:

Due to a general strike and additional "occupation" of the department by the aforementioned group of students it was not possible to visit the department during day 3 of our scheduled visit.

Summary: The Department of Chemistry of AUTH prepared a program that allowed meetings and discussions with all academic divisions of the department. In these meetings most of the members of the teaching staff were present. Furthermore we had the opportunity to speak to all laboratory instructors, to visit the laboratories, as well as the research laboratories of all divisions. We also discussed with representative of the students (undergraduate, masters and doctoral students; a total of about 35-40 students). Finally, we visited the library.

II. The Internal Evaluation Procedure

- *Appropriateness of sources and documentation used*

The documentation concerning the internal evaluation till 2008 was received by the members of the external evaluation committee prior to the evaluation process. Additional documents with detailed information concerning several research aspects and activities as mentioned above were received during the visit.

- *Quality and completeness of evidence reviewed and provided*

The furnished internal report reflects the current situation (i.e., number of students up to 2010; the actual number and list of current Departmental staff), clearly describes the structure, organisation, and duration of the entire degree.

- *To what extent have the objectives of the internal evaluation process been met by the Department?*

Overall the Internal Report met the objectives of the Evaluation Process.

A1. Undergraduate Curriculum

The courses taught in the chemistry department of the Aristotle University of Thessaloniki during the first four years of study are listed in page 17 of the internal evaluation report.

Goals and objectives of the Under-Graduate Curriculum (UGC)

While the objective of the UGC is the thorough education of undergraduates in the Chemical Sciences the goals of the current cumbersome and highly convoluted curriculum allows for the excessive professoriate to justify their legally mandated need for teaching. In addition, the UGC seems to satisfy intellectual and scientific needs of some of the staff. Their efforts to disseminate voluminous specialized knowledge to undergraduates creates unfair demands and pressures to the students who eventually have a hard time to learn and graduate.

Despite these major obstacles the department is generally successful in educating undergraduate students who have favorably testified that they feel theoretically well informed. Overall, the dedication of the good students who graduate, compares well with their international colleagues. The lack of a routine national or international testing, however, such as the Graduate Record Examination, (GRE) makes it difficult to quantify their excellence.

- *What is the plan for achieving excellence?*

The departmental self study and its administrative leadership, has recognized the curriculum's convoluted nature and has created a revitalized significantly reduced program of studies which, while it represents an improvement, it is only a marginal improvement if this is to be an effective curriculum. It is also unfortunate that the attendance to the lectures is not mandatory and the student culture focuses at identifying specific topics of high probability in becoming exam questions. On both fronts these issues represent obstacles in achieving excellence. It is also not known to what extent the taught material is regularly updated.

- *How were the objectives decided? Which factors were taken into account?*

The department has proceeded in creating a revitalized UGC due to the following recognized factors: The excessively long average time to graduation; the international demands to Chemical Education; the unusually high number of teaching staff and the legally mandated teaching duties. Additional motivation and considerations were also the relatively low proficiency and interest of the incoming first year students in the Chemical sciences.

Moreover, the department has identified that the large number of required courses to graduation and the way these courses are taught, are inhibiting factors toward promoting teaching effectiveness. Notably, the department has also identified that the individual course evaluation processes, currently in place are ineffective due to a multitude of reasons including the lack of student participation.

IMPLEMENTATION

- *How effectively is the Department's goal implemented by the curriculum?*

The department has designed programs in both graduate and undergraduate education and curricula that at times attempt to emulate those of universities in Europe and the U.S.

Despite the honest departmental efforts in revitalizing the UGC, there is still a multitude of

considerations that dictate serious pondering as to its effectiveness. Primarily, even a cursory evaluation of the UGC, coupled with the desperate/critical testimony of the students, indicates that it is still rather enlarged, cumbersome and inflexible, maintaining the endemic limitations of the earlier curriculum. For example the mere lack of a series of pre-requisite courses within the structure of the UGC indicates serious deficiencies as to the effectiveness in the teaching of the Chemical Sciences. This coupled with the lack of even rudimentary undergraduate student advising, forms the foundations of a confusing and unfocused educational system prone to individual manipulations both by the faculty and the student body. The above are further compounded by the culture of co-teaching for most courses by multiple faculty members (i.e., 2, 3 or 4 faculty members teaching each course). Joint teaching, of core classes based on the traditional lecturing style needs to be systematically discouraged unless adequate planning and coordination between instructors has taken place and it is conducted for the benefit of the student and not for logistic reasons. In addition modern principles and conclusions related to published studies related to multiple teaching models (see **Francisco J. S. et al** *J. Chem. Educ.*, 1998, 75 (2), p 210, **DOI: 10.1021/ed075p210**) should be consulted. It is thus imperative that the needs of the UGC receive immediate attention by streamlining it further, by creating a series of effective pre- requisites and by dramatically eliminating co-instruction and revising their mode or instruction.

- *How does the curriculum compare with appropriate, universally accepted standards for the specific area of study?*

Such a comparison will be unfavourable, since both faculty and students admit that the enumerated factors (large number of faculty, legally mandated teaching duties, lack of advisors and pre-requisites, unregulated and non-coordinated co-instruction etc.) still limiting the effectiveness of the program.

- *Is the structure of the curriculum rational and clearly articulated?*

Overall, there seems to be an orderly operation within the classroom and laboratory instruction, as well as availability of “study maps”. However, the magnitude of UGC creates an inherently cumbersome structure.

- *Is the curriculum coherent and functional?*

No, based on the above arguments.

Is the material for each course appropriate and the time offered sufficient?

The specific material for each course was provided and their details adequate for examination. Overall, the structure of the individual courses was found to be in accordance with those encountered in other acknowledged programs of chemical education. As to the question of the “time offered” the issue of lack of formal and enforced pre-requisites represents again a serious drawback within the curriculum.

- *Does the Department have the necessary resources and appropriately qualified and trained staff to implement the curriculum?*

The departmental facilities within the new building provide classrooms and laboratories of adequate quality. A number of departmental facilities especially within the old building

have been remodelled and provide classrooms and laboratories for teaching. However, in some cases, serious safety deficiencies were identified in relation to effectively functioning fume-hoods, fire hazards, eye and body emergency wash stations.

Overall, the instrumental infrastructure was found to be of exceptional quality including study halls.

RESULTS

- *How well is the implementation achieving the Department's predefined goals and objectives?*

The implementation of the new curriculum is in progress and the assessment of its pros and cons is not possible at this stage.

- *If not, why is it so? How is this problem dealt with?*

N/A

- *Does the Department understand why and how it achieved or failed to achieve these results?*

N/A

IMPROVEMENT

- *Does the Department know how the Curriculum should be improved?*

We are not in a position to respond to this question, but the following issues should be addressed :

(a) The heavy course load demanded by the UGC.

(b) The lack of job opportunities for the diploma holders needs to be taken into account and in consultation with the "user sector" the UGC and the numerous specialties be revisited, revised, streamlined and focused.

(c) The great number of faculty (94 plus the additional 8 who are waiting for the formal initiation of their duties) who must be assigned teaching responsibilities needs to be revisited. Solutions that should be considered include: reduction of the number of required courses and significant reduction of the number of faculty members. The former should be achievable, while the latter represents a major challenge.

(d) It is imperative that the needs of the UGC receive immediate attention by creating a series of effective pre- requisites and by dramatically eliminating co-instruction and revising their mode or instruction.

- *Which improvements does the Department plan to introduce?*

Aside from the revision of the undergraduate program, no further information on such departmental plans was provided in the internal evaluation report and the oral presentations.

A2. Postgraduate Curriculum

Goals and objectives of the General Post-Graduate Program (GPP).

The primary goal of the GPP is an in depth post graduate education in a very large variety of professional specializations. In a manner similar to the undergraduate curriculum

the GPP is also highly convoluted and demanding. The department offers 16 areas of such endeavors with 68 graduate courses. This represents a very large of area of educational activities that manifests itself to the endemic problems already identified by the self-study of the graduate students. This certainly serves the needs of the excessive professoriate to justify their legally mandated need for teaching.

Despite the cumbersome GPP the department appears to be generally successful in educating graduate students who compare favorably with graduates of other institutions as far as claiming employment and post-doctoral opportunities.

- *What is the plan for achieving excellence?*

The departmental internal evaluation, has recognized some issues with the curriculum but their degree of awareness as to the gravity of the situation seems to be inadequate. Overall, the lack of strategic planning within the department (i.e., among the four sectors and the ten laboratories) as to addressing areas of activity with significant societal impact is reflected in the GPP. Consequently, comments made in other section of this report related to Research are also applicable to this vital sector of the department's activity.

- *How were the objectives decided? Which factors were taken into account?*

No information was provided.

IMPLEMENTATION

- *How effectively is the Department's goal implemented by the curriculum?*

The committee met with a motivated group of graduate and undergraduate students of the department and their comments are shown below (as stated by the students):

- *Most of the professors are characterized by lack of interest. Their behavior to the students is characterized by impoliteness/rudeness.*
- *Funding is extremely low and there is a lack in transparency of how this is distributed.*
- *We urgently wish access to ALL existing research apparatus independently of the location of this equipment. Furthermore, use of these instruments should not implicate, that their owners will be automatically co-authors in a possible scientific publication.*
- *We need dramatic reduction of the number of courses, renovation of the laboratories, and supply of research reagents.*
- *The cooperation between the professors is non-existent.*

- *Lack of technical staff / instructors.*
- *The students demand to prohibit activity of political parties within the department's space.*
- *There is lack of safety in the labs.*

The endemic problem of co-teaching seems to be further compounded at the graduate level and needs to be eliminated.

- *How does the curriculum compare with appropriate, universally accepted standards for the specific area of study?*

It does not compare at all well especially in view of the large number of faculty, their low productivity, their inappropriate behaviour and indifference toward the graduate student needs (see p 141 of the internal evaluation), the unsafe environment (especially acute issue within the organic chemistry section) and the large number of apparently under-utilized instrumental resources already provided by society.

- *Is the structure of the curriculum rational and clearly articulated?*

Overall, there seems to be an orderly operation within the classroom and laboratory instruction as well as availability of "study maps".

- *Is the curriculum coherent and functional?*

No, based on the above arguments.

Is the material for each course appropriate and the time offered sufficient?

The specific material for each course was provided and their details adequate for examination. Overall, the structure of the individual courses was found to be in accordance with those encountered in other acknowledged programs of chemical education.

- *Does the Department have the necessary resources and appropriately qualified and trained staff to implement the curriculum?*

The departmental instrumental facilities are more than adequate but seriously underutilized by the wide body of the graduate students. In addition, in some cases, serious safety deficiencies were identified in relation to effectively functioning fume-hoods, fire hazards, eye and body emergency wash stations. During the committee's site visit the air quality within the organic chemistry laboratories was found rather disturbing and for some members uncomfortable. Surprisingly, a large inventory of solvents and waste solvent containers were found to be present at a single entrance/exit of a large laboratory (organic chemistry), which is an unacceptable fire hazard.

B. Teaching

APPROACH

The underlying principle in the teaching philosophy of the department is to provide basic knowledge of chemistry through core courses in the first three years to be followed with elective courses in the fourth year, and graduate courses in the masters program.

- **Teaching methods used, course updates, student participation, grades, and average duration for the undergraduate degree**

After 10 years of operation the study program used was found problematic. Major problems were a) a low average undergraduate degree of 6.8/10 b) a long duration of studies for the undergraduate degree of 6.8 years with 50% of the students finishing after 6.00 years and an alarming 30% that do not finish their studies and c) insufficient evaluation of progress. These problems were attributed mainly to a great number of courses (52-56). The large number of courses was generated as a result of a ballooning number of faculty that eventually had to be employed.

The new program of studies that was chosen has kept the 3:1 framework of the older program with six semesters of basic chemistry and two semesters of electives (25 courses) in four directions in chemistry. The success of the new program will have to be evaluated after a minimum of four years.

- **Teaching staff/ student ratio, interactions of faculty and students, and faculty teaching hours per week**

The teaching staff/student ratio for course work is quite favorable but unfortunately is based on 99 faculty who often teach jointly. The teaching staff for course work consists of about 99 faculty members.

The teaching staff/student ratio for laboratory work cannot be accurately determined mainly due to the co-teaching practices. The availability of faculty to students is less than satisfactory based on committee interviews with the students.

- **Teacher/student collaboration**

According to the interview with the students, this collaboration is less than desirable.

Adequacy of means and infrastructure resources

Whereas the classrooms and the teaching laboratories are properly equipped with basic equipment, the supply of reagents in the laboratories, is at times inadequate for the successful operation of the laboratory. The need of a, frequently restocked, stock room with often-used reagents and solvents is obvious.

Use of information technologies

Use of Internet resources is not widely spread, with a few online bibliographic databases, electronic books, wireless internet access, video recording, and webinars.

Examination system and assessment of course work by the students

Multiple methods of assessing students are available in the new teaching program which, as stated previously, is at present employed. There is a student questionnaire for the assessment of the quality of each course. The effectiveness of quality assessment must await the evaluation of the new program.

IMPLEMENTATION

- **Quality of teaching procedures**

The teaching methods that will be available in the new teaching program should be

evaluated after four years. Its success obviously will depend on the dedication and enthusiasm of the faculty in charge.

Quality and adequacy of teaching materials and resources.

The teaching material and resources are average.

- ***Quality of course material. Is it brought up to date?***

The frequency of lecture updating is not clear and the quality of the course material appears to be adequate.

- ***Linking of research with teaching***

During the fourth year of undergraduate studies, a few students are exposed to research through the dissertation. Also, during the industrial practical activity students are involved in applied research. It will be beneficial to a select number of students in their second and/or third year of studies, to have a formal option to join a research laboratory for research. One option is to introduce it in the curriculum as independent research with credit for a course. Another option is to provide modest stipends upon availability of funds.

- ***Mobility of academic staff and students***

The department has several collaborations with academic and research institutions within Greece and abroad, and the programs SOCRATES/ERASMUS/Thematic COST Actions have limited participation by faculty members and students.

These efforts could improve in the future.

- ***Evaluation by the students of (a) the teaching and (b) the course content and study material/resources***

The evaluation by the students during the interview were neutral on (a) and quite negative on (b). The formal teaching evaluation process, through access to a secure internet university site at which each student will provide his/her comments anonymously is highly recommended. It is also suggested that the undergraduate and masters students create awards for the best teaching staff members annually, where the nomination, assessment and selection process is student controlled exclusively.

RESULTS

- ***Efficacy of teaching***

(see above in the APPROACH and IMPLEMENTATION sections)

- ***Discrepancies in the success/failure percentage between courses and how they are justified.***

Based on Tables of the Internal evaluation Report, we consider that there are no major discrepancies.

- ***Differences between students in (a) the time to graduation, and (b) final degree grades***

(see above in the APPROACH section)

- ***Whether the Department understands the reasons of such positive or negative results?***

<p>It is apparent in the adoption of the new teaching program, that the department recognized the weaknesses of the previous program and developed a new one.</p> <p>Financial support is a vital issue for a fraction of undergraduates and for the vast majority of students who pursue their masters degree without receiving any fellowship or teaching assistant stipend support.</p>	
<p>IMPROVEMENT</p> <ul style="list-style-type: none"> • <i>Does the Department propose methods and ways for improvement?</i> <p>As stated previously the department is aware of problems associated with a) the large number of faculty and b) the consequent large number of courses. The design of the new undergraduate teaching program is a good starting point. However a reduction of the offered courses, maintaining the same number of faculty, may lead to an increase in the numbers of “team-teachers”. The department does not seem to recognize the problem which admittedly is a challenging one.</p> <p><i>What initiatives does it take in this direction?</i></p> <p>The excessively large number of faculty members and its large fraction, who are essentially unproductive in research, needs to be addressed. A possible solution to this problem may be the classification of the faculty into “faculty with teaching accomplishments primarily (i.e., Category 1)” and “faculty with teaching and research accomplishments (i.e., Category 2)”. “Category 1 faculty” will be expected to do a small amount of research and mostly teaching and the “Category 2 faculty” mostly research and a reduced amount of teaching. On equal salaries, the teaching loads of the “Category 2 faculty” should be lighter than those of the “Category 1 faculty”. As the faculty change their interests they should be able to transfer from one group to the other in a system that will be balanced in teaching performance and research output.</p> <p>Towards improving the quality and conditions of graduate studies at the masters level, the admitted students need to receive fellowships or teaching assistantships that will alleviate the financial issue and allow them to participate in both teaching and research. This is not a direction that the department can address in its totality, and requires the attention and consistent action of the ministry of education.</p>	

C. Research

APPROACH

- What is the Department's policy and main objective in research?

The research in the department is carried out currently by 94 faculty members (Professors, Associate Professors, Assistant Professors, and Lecturers) working in four sectors which are further divided in ten laboratories. Those are:

Sector of General Inorganic Chemistry

- Laboratory of Inorganic Chemistry
- Laboratory of Applied Quantum Chemistry

Sector of Organic Chemistry and Biochemistry

- Laboratory of Organic Chemistry
- Laboratory of Biochemistry

Sector of Physical, Analytical and Environmental Chemistry

- Laboratory of Physical Chemistry
- Laboratory of Analytical Chemistry
- Laboratory of Environmental Pollution Control

Sector of Chemical Technology and Industrial Chemistry

- Laboratory of General and Inorganic Chemical Technology
- Laboratory of Organic Chemical Technology
- Laboratory of Food Chemistry and Technology

The research within this chemistry department over the last four decades until today has been carried out with a strategy that essentially has been established in the mid sixties with exceptions represented by the laboratories of Biochemistry, Analytical Chemistry, Environmental Pollution Control, General and Inorganic Chemical Technology, Organic Chemical Technology, and Food Chemistry Technology. It is noteworthy that the excessive number of faculty members (94 in total with additional 8 waiting for the initiation of their official duties) is not commensurate with the anticipated level of research performance. Many faculty members attributed this to the teaching overload as indicated in the internal evaluation report.

- Has the Department set internal standards for assessing research?

The department used the common international standards for assessing the published results of research (i.e., number of publications and citations; H index (ISI Web of Science); impact factor of journals). The oral presentations during the visit of the External Assessment Committee focused on the aforementioned metrics for the period of 2006-2010. The oral presentations did not include a section on recognition of faculty via domestic and international awards.

A fraction of the newly hired faculty members over the past few years, have applied the current international standards. They strived to publish in high impact factor scientific journals. In spite of the difficulties emanating from deficiencies in infrastructure, they have managed to address unresolved scientific and engineering problems in the chemical sciences.

IMPLEMENTATION

- *How does the Department promote and support research?*

Due to the lack of any strategy at the departmental level, the department does not have any means and ways to support research. It became obvious that a number of faculty members might have interpreted/maintained that the only mission expected from the state law is teaching without any involvement for research activities.

- *Quality and adequacy of research infrastructure and support.*

The quality of the research and support is not at adequate levels due to the ill fading infrastructure and not respecting the minimum of safety standards. The support is almost non-existent since limited funding is available. The expected acquisition of a NMR 500Mhz to be housed in the Chemistry department and a NMR 600Mhz instrument to be housed in the Chemical Engineering department will benefit the research activities of several groups.

- *Scientific publications*

According to the updated Internal Assessment report (based on the oral presentations), during the five year period of 2006-2010, the Academic Staff of the Department published 1,148 papers in peer reviewed academic journals and had 29,196 citations. According to ISI Web of Science (as of February 10, 2011; unrestricted time period), the Professors of the department had an average H-Index of 18.9, the Associate Professors had an average H-Index of 12.7, the Assistant Professors had an average H-Index of 10.1, and the Lecturers had an average H-index of 10.9.

The average H-Index and highest H-Index for each of the (10) laboratories are as follows:

Sector of General Inorganic Chemistry

- Laboratory of Inorganic Chemistry (Average H-Index: 13.2, Highest H-Index: 33)
- Laboratory of Applied Quantum Chemistry (Average H-Index: 16, Highest H-Index: 25)

Sector of Organic Chemistry and Biochemistry

- Laboratory of Organic Chemistry (Average H-Index: 9.9, Highest H-Index: 18)
- Laboratory of Biochemistry (Average H-Index: 13.3, Highest H-Index: 19)

Sector of Physical, Analytical and Environmental Chemistry

- Laboratory of Physical Chemistry (Average H-Index: 13.8, Highest H-Index: 22)
- Laboratory of Analytical Chemistry (Average H-Index: 15, Highest H-Index: 19)
- Laboratory of Environmental Pollution Control (Average H-Index: 19.6, Highest H-Index: 27)

Sector of Chemical Technology and Industrial Chemistry

- Laboratory of General and Inorganic Chemical Technology (Average H-Index: 13.9, Highest H-Index: 33)
- Laboratory of Organic Chemical Technology (Average H-Index: 14.4, Highest H-Index: 28)
- Laboratory of Food Chemistry and Technology (Average H-Index: 12.3, Highest H-Index: 26)

It is noteworthy that for the five-year period of 2006-2010, 21.3% of the Academic Staff of the Department (i.e., 20 faculty members) have less than 5 publications in peer reviewed academic journals (based on documents provided to the committee by the department during the visit).

Also, the aforementioned average H-indices have significant room for improvement.

The scientific publications vary in quality and quantity from sector to sector and from laboratory to laboratory. It was interesting to note that most productive areas were in the laboratories with the newly hired members and in some cases in places with daring senior members who did take the risk to not follow the traditions of the founding members of the last century.

- *Research projects*

According to the funding record presented during the visit for the period 2006-2010, we can make a number of important observations for the overall departmental funding record:

- Support from the government for the period of 2000-2010 has been on average at about 330K Euros per year while there has been a reduction in 2010 to about 280K Euros;
- Support from competitive research grants from the government for the period of 2006-2010 has been low, monotonically declining, and ranged from about 600k Euros in 2006 to about 50K Euros in 2009 to almost non-existent in 2010;
- Support from competitive research grants from foundations during 2006-2010 ranged from about 500K Euros in 2009 to about 140K Euros in 2010;
- Support from industrial companies during 2006-2010 has grown from about 50K Euros in 2006 to about 500K Euros;
- Support from competitive research grants from the European Union during 2006-2010 was very low and more specifically was about 350K Euros in 2006, 500K Euros in 2007, 150K Euros in 2008, 650K Euros in 2009, and 450K Euros in 2010;
- Overall support from competitive research grants for the period 2006-2010 was very low for the department especially when one takes into account the excessive size of the faculty (i.e., 94 faculty members). For instance in 2010 the total support from competitive research grants reached about 1,400K Euros which corresponds to about 15K Euros per faculty member.

In sum, funding from the government (e.g., ministry of education and the General Secretariat of Research and Technology) follows a very worrisome trend of significant reduction to a point of virtual elimination. The research projects are of variable quality in terms of novelty, innovation capacity and potential impact to society. It is worth noting that the research projects excelling in two or all of the above criteria are the ones that have and had direct relevance to issues of societal impact. Also, the competitive nature of funding from the European Union is at very low levels, exhibited wide fluctuations, and introduces uncertainty for sustainable research funding. The aforementioned funding data and funding trends in competitive research grants represents a major issue for the department and its

reversal will play a key role in revitalizing the research directions and expected recognition of the department.

- *Research collaborations*

In general the collaborations are almost nonexistent at all levels within the department. As was mentioned in the internal evaluation report, the lack of solidarity between the faculty members did not allow over the years the development of collegial spirit to nurture fruitful collaborations at all levels. As a consequence, no access to expensive infrastructure is allowed to other researchers of the department apart from the immediate environment of the guardian of the specific equipment or experimental platform.

Prime examples of important research collaborations have been the one with the ESA and the ones with the involvement of certain members of the department through the action of european programs. It is worth noting also that the direct relations of some laboratories with the local economy has generated a source of challenging technological problems to solve and helped to bring them at the later stage in the european scene of establishing standards (e.g., for the environmental pollution measures and control).

RESULTS

- *How successfully were the Department's research objectives implemented?*

The departmental objective of excellence in research is attained to a high degree.

- *Scientific publications*

(see comments in the IMPLEMENTATION section)

- *Research projects*

(see comments in the IMPLEMENTATION section)

- *Research collaborations*

(see comments in the IMPLEMENTATION section)

- *Efficacy of research work. Applied results and patents*

There was no information provided on patents. A patent office and a technology transfer office would benefit the results of research work.

Is the Department's research acknowledged and visible outside the Department? Rewards and awards.

There was no information on faculty members with international recognition reflected in awards. This is an area with significant room for improvement.

D. All Other Services

E. Strategic Planning, Perspectives for Improvement and Dealing with Potential Inhibiting Factors

- *Potential inhibiting factors at State, Institutional and Departmental level, and proposals on ways to overcome them*

The inhibiting factors at the state level are (a) the increased number of admitted students for undergraduate studies which is currently at the level of (160); (b) the limited funding opportunities and support from the ministry of education during 2006-2010; (c)

the lack of fellowships and/or teaching assistantships for the masters program; (d) the increased competitive level for external funding; (e) long delays in the approval and hiring of new faculty; (f) limited number of vital technical support personnel (ETEP) and improper duties for personnel (IDAX) and (g) excessive degree of state intervention and over-regulation results in a cumbersome administrative system with consequences very apparent in the operation of this department.

The potential inhibiting factors at the institutional level are (a) the reduced support of funds for the departmental operational expenses; (b) the lack of transparent metrics for the distribution of funds from the institution principals to the departments which need (i) to reflect the quality of the research and teaching programs, and (ii) to be distributed based on documented excellence and recognition. A primary example of a critical need for the Chemistry department of the Aristotle University of Thessaloniki is the institutional funding and support for the acquisition of a 500MHz NMR and a 600 MHz solid state NMR instrument. These instruments can serve inter- and intra-departmental needs and are vital for a first rate Chemistry department.

A critical inhibiting factor at both the state and the institutional level is the lack of a meritocracy-based and documented excellence-based ranking systems. These should address the ranking for (a) the universities (i.e., institution wide), and (b) the departments (e.g., Chemistry departments).

The inhibiting factors at the departmental level are (a) the excessively large number of total faculty members with a large fraction of Associate Professors; (b) significant portion of faculty (i.e., 21.3%, 20 faculty members) with less than five publications in peer reviewed journals during 2006-2010; (c) publications in high quality journals, citations, and H-index statistics need improvement; (d) unprecedented team teaching practice of core and elective courses at both undergraduate and graduate levels (i.e., two, three, or four faculty members for each course); (e) long graduation time (i.e., 6.8 years) with 30% of the incoming students never graduating; (f) lack of course pre-requisites and lack of proper implementation of teaching evaluation schemes; (g) extensive service teaching to students of other departments; (h) limited number of vital technical support personnel (ETEP) and improper duties for personnel (IDAX); (i) very low funding record from competitive state and European agencies; (j) safety concerns and operational laboratory issues; (k) aging distribution profile of faculty skewed towards the high end; (l) inappropriate treatment of students by the faculty; (m) lack of strategic academic planning; (n) lack of synergy and collegiality to address vital research, teaching, and administrative issues; (o) reluctance to create openings at senior faculty levels, (p) implementation of effective, functional and transparent hiring practices with major participation of external (outside of Greece) examiners; (q) long delays in the approval and hiring of new faculty; (r) lack of start-up packages for new hires; (s) low level of collaborative intra-departmental research proposals which could join forces across

departmental divisions; and (t) the perceived reluctance of branching out and enhancing the area of chemical biology and materials chemistry.

Specific suggestions to address the aforementioned inhibiting factors at the state and institutional level are:

1. Reduce the number of admitted undergraduate students.
2. Acquire a 500 MHz and a 600 MHz NMR instrument for intra- and inter-departmental use.
3. Enhance the teaching and research frontiers in chemical biology and materials chemistry.
4. Introduce transparent metrics, based on documented departmental excellence, for the distribution of funds at the institutional and state level.
5. Institute fellowships and teaching assistantships at the masters and doctoral levels.
6. Initiate and sustain regular cycles of funding mechanisms from the ministry of education and the General Secretariat of Research and technology.
7. Establish and coordinate intra- and inter-departmental research proposals for competitive external funding opportunities.
8. Introduce meritocracy and excellence-based ranking systems for the universities (i.e., university wide) and the departments (e.g., Chemistry).
9. Minimize the degree of state intervention and over-regulation which results in a cumbersome administrative system with consequences very apparent in the operation of this department.

F. Final Conclusions and recommendations of the EEC

Conclusions and recommendations of the EEC on:

- *the development of the Department to this date and its present situation, including explicit comments on good practices and weaknesses identified through the External Evaluation process and recommendations for improvement*

The external evaluation aims at enhancing the existing knowledge base that could be used for identifying future priorities for initiatives in research and teaching.

The Chemistry department of the Aristotle University of Thessaloniki has established a research and teaching program which on average is of modest impact and quality. The identified weaknesses and good practices include:

- Excessively large number of total faculty members with a large fraction of Associate Professors;
- Significant portion of faculty (i.e., 20 faculty members) with less than five publications in peer reviewed journals during 2006-2010;
- Publications in high quality journals, citations, and H-index statistics need improvement;
- Unprecedented team teaching practices of core and elective courses at both undergraduate and graduate levels (i.e., two, three, or four faculty members for each course) which are objectionable;
- Long graduation time (i.e., 6.8 years) with 30% of the incoming students never graduating;

- Lack of course pre-requisites and lack of proper implementation of teaching evaluation schemes;
- Extensive service teaching to students of other departments;
- Very low funding record from competitive state and European agencies;
- Safety concerns and operational laboratory issues;
- Aging distribution profile of faculty skewed towards the high end;
- Inappropriate treatment of students by the faculty (as stated by the students);
- Lack of strategic academic planning;
- Lack of synergy and collegiality to address vital research, teaching, and administrative issues;
- Reluctance to create openings at senior faculty levels,
- Need for implementation of effective, functional and transparent hiring practices with major participation of external (outside of Greece) examiners;
- Lack of start-up packages for new hires;
- Low level of collaborative intra-departmental research proposals which could join forces across departmental divisions;
- Perceived reluctance of branching out and enhancing the area of chemical biology and materials chemistry.
- Abundance of instrumentation for most laboratories.
- Forward looking department with positive attitude for potential improvements.
- Revitalization efforts at the undergraduate and graduate programs are apparent through the new initiatives.
- Alumni have excelled in academic (national and international) and industrial positions.
- Graduate and undergraduate students with commitment, dynamism and tenacity.
- The laboratories of Biochemistry, Analytical Chemistry, Environmental Pollution Control, General and Inorganic Chemical Technology, Organic Chemical Technology, and Food Chemistry Technology have introduced modern approaches and lead the departmental research efforts.
- New initiatives were introduced for hiring faculty members outside of the department.

The external evaluation committee has the following recommendations:

- Dramatic reduction of the number of faculty members. This can be attained through regular retirements (albeit at a slow pace) and the classification of the faculty into “faculty with teaching accomplishments primarily (i.e., Category 1)” and “faculty with teaching and research accomplishments (i.e., Category 2)”. “Category 1 faculty” will be expected to do a small amount of research and mostly teaching, while “Category 2 faculty” will do mostly research with reduced amount of teaching. Such a classification of the faculty will allow for appropriate re-allocation of laboratory research space.
- The department needs to prepare a coherent strategic academic plan based on

synergistic and collegial discussions among all sectors and laboratories. The ultimate goal is to establish their short, medium, and long-term visions. This will naturally enhance intra- and inter-departmental collaborative research efforts that follow new directions.

- Substantial reduction of team teaching practices at both undergraduate and graduate programs, and improvement of grading practices and teaching evaluation procedures.
- Implementation of effective pre-requisite requirements coupled with academic advising throughout the curricula which will potentially lead into shorter average graduation times.
- Increased efforts for quality research proposals aiming at dramatic increase of the competitive research grants from the State, Industry, and the European Union.
- Implementation of effective, functional and transparent hiring practices with major participation of external (outside of Greece) examiners.
- Adoption of internationally accepted practices for laboratory safety and creation of a courteous environment for the students.
- Branching out and enhancing the areas of chemical biology and materials chemistry.
- *the Department's readiness and capability to change/improve*

The External Evaluation Committee perceives that the members of the Chemistry Department are forward thinking and need to think carefully about the current and future needs.

the Department's quality assurance

The department needs to address all points mentioned in section E.

The Members of the Committee

Name and Surname

Signature

1. Professor Demetrios Coucouvanis _____

2. Professor Dimitris S. Argyropoulos _____

3. Professor Christodoulos A. Floudas _____

4. Professor Athanassios Giannis _____

5. Professor George Hadziioannou _____