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Diploma

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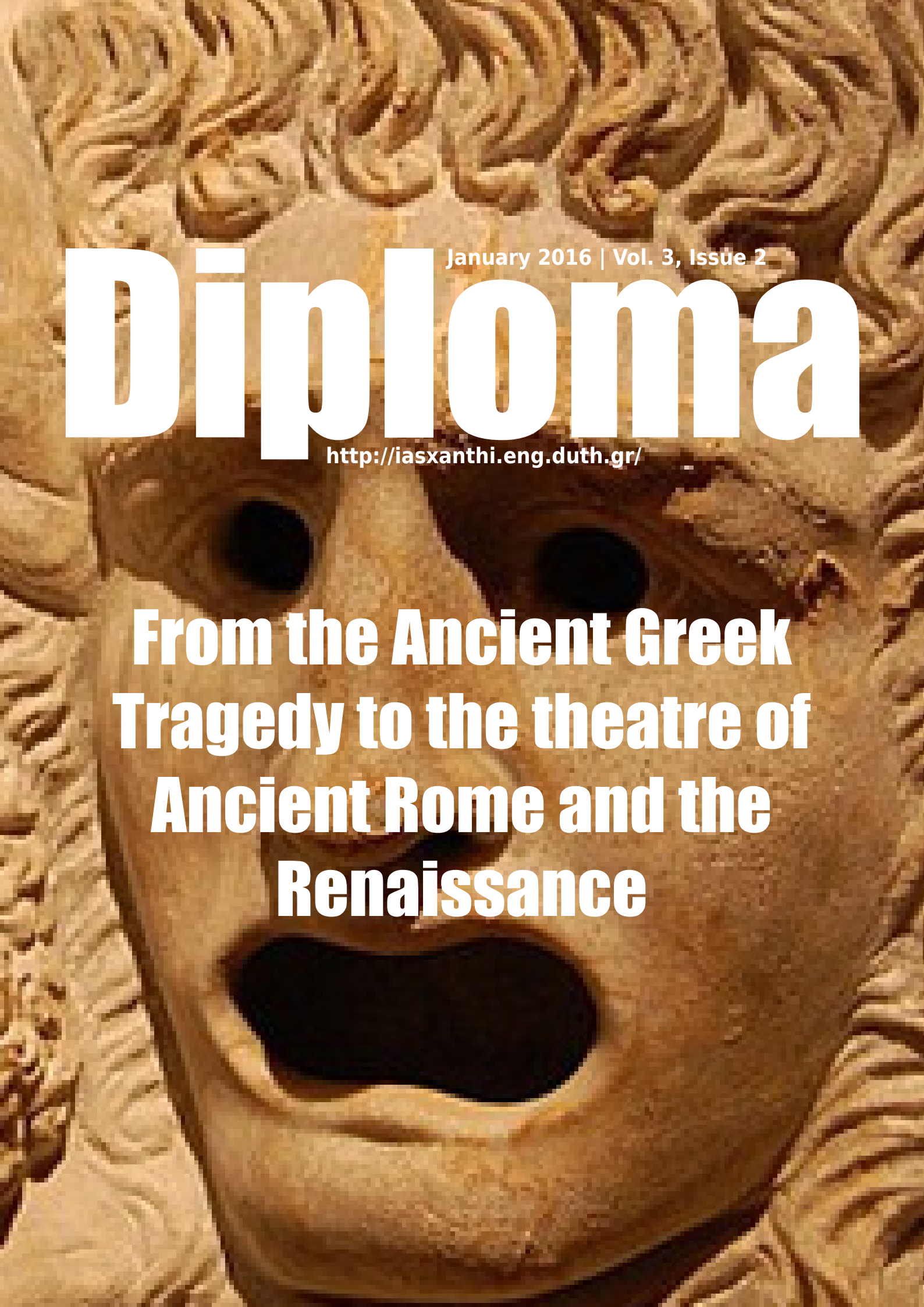

From the Ancient Greek Tragedy to the theatre of Ancient Rome and the Renaissance

Democritus **I**ndustrial Ap**PL**icati**O**ns **MA**gazine

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SBC·DUTh

ias

Letter from the Advisor

Dear readers of the DUTh IAS SBC Diploma

Another prosperous year of IEEE Industry Applications Society and of our Student Branch Chapter (SBC) is completed and the members of our SBC are proud to present the new issue of their magazine. All the students, mainly from the Department of Electrical and Computer Engineering and some from the Department of Production and Management Engineering, did their best to win again numerous awards at the last IEEE IAS Annual Meeting in Dallas, Texas and place the SBC of Democritus University of Thrace in the top universities in terms of scientific and leadership capabilities of its students. It is not coincidence that soon we will be hosting Dr. Tomy Sebastian, President of IEEE Industry Applications Society in Xanthi, the third out of the last four Presidents of IAS, and Dr. Peter Magyar, IAS Chapters and Membership Department (CMD) Chair for the third time, before we even celebrate our fourth anniversary of our inauguration meeting. On the contrary it is an honor for our SBC and a great opportunity for our students to "GET CONNECTED". As their Advisor I am very proud to present to you the 6th issue of DIPLOMA.

Prof. Athanasios Karlis

Chapter's Advisor

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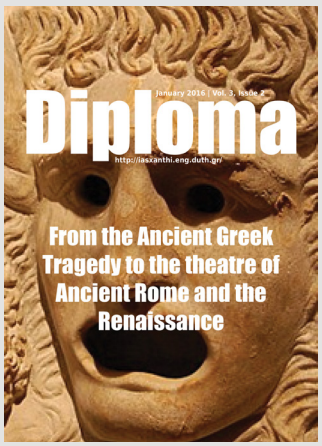
DIPLOMA



On the cover: From the Ancient Greek Tragedy to the theatre of Ancient Rome and the Renaissance

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UPCOMING ACTIVITIES

by Aristotelis Farmakis, DUTh SB IAS Chapter Chair

The members of Democritus University of Thrace SB IAS Chapter have, justifiably, been proud of our active dedication to promote engineering in its most profound way, since day one!

We intend to stay that way and prove that even with the toughest finincial circumstances around, an Engineer's education has to be both up to date and in touch with real life applications of theory and practice. That said we are committed to continue an active stance, that of organizing events (academic visits, lectures, hands on activities etc.), yet prove that the stimulus we get from all those Industry Professionals, Entrepreneurs, Academia Representatives and student/ young professionals peers of ours all over the world, can and will be practically embodied by us, students. And it can be proven, by keeping in touch with our Chapter's members' initiatives.

So what is next? More active organizing and participation of course, with the first one being an organized academic visit and guided tour in an Engineering Machine Shop. Amongst others, Electrical Engineers, nowadays, tend to underestimate the value of that good old-fashioned screwdriver, yet we should never forget that... in order to change everyday life, most problems' solutions have to first be designed, but then, they actually have to be machined as well.

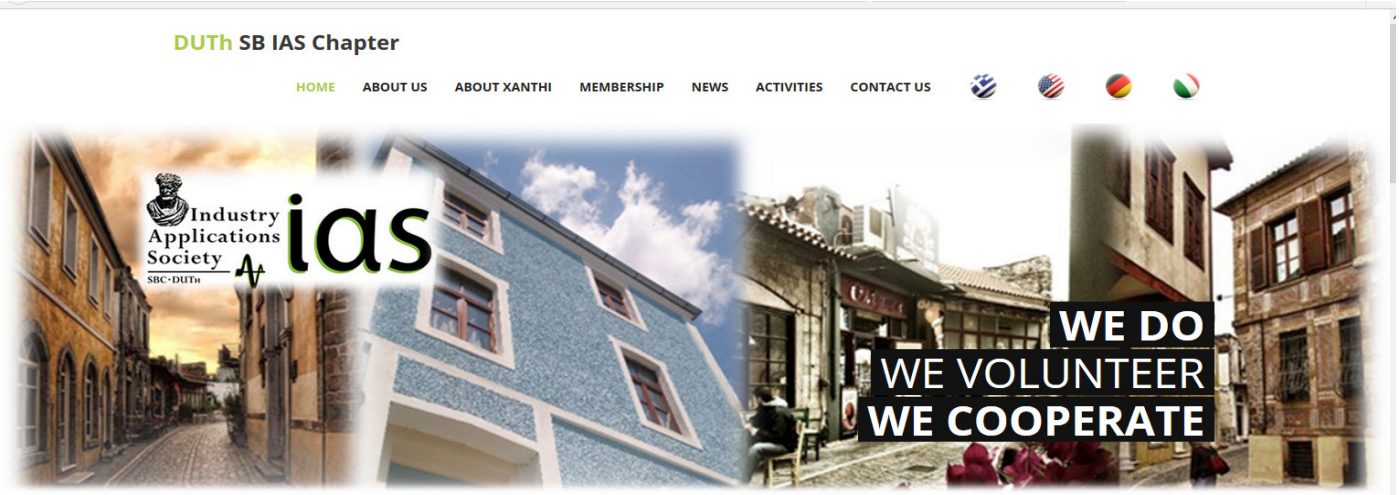
Along with that, we strongly believe that in order to actually change the world you have to first be able to realize how it works. You have to be able to follow the trends, to understand entrepreneurship and understand the market. That is why, with the valuable help of our advisor, we have considered a talk from a young engineer, masters student, to stand up and narrate his side of the story of what it really is like to start not one (1), but two (2) startups of your own. A most valuable lesson, indeed, especially when spoken by a fellow young engineer, even student as well, hopefully eager to take us through his personal experience, one much closer to possibly ours, given we decide to take that path, the one of entrepreneurship.

Along with those, we also plan to organize a lecture on Industrial Automations, but not just one in a vague general area, rather one regarding some specific Standard for residential and commercial building control. We want to understand how to connect bus devices that are able to communicate, to exchange nformation via a medium

and if there is a most common way, one established by now in the market to do so. We have already raised some thoughts and found one worldwide standard that manufacturing companies, installation partners and something really important, technical universities around the world are taught how to use and comply with, that of KNX. Thus, we are in communication with official representatives to try and convince them to come over and introduce that standard to us.

At the same time, we try to organize lots of other activities, as well, but most important, what is next for us is not just academic trips and lectures, not just watching and listening, as we are all about implementation and initiatives as well. After all, you are currently reading about it in a past initiative of our Chapter's, our all-student edited DIPLOMA Magazine.

So, our Chapter is soon to have a new website, one to take the place of our current one, one that has been multiply awarded. Expect it to be big news as we intend to have it up and running in the early first quarter of 2016. A clearly functional application of programming, design and marketing, an online engaging presence, meant to attract our newcomers' interest for active participation and involvement within our IEEE Industry Applications Society, in a highly readable context.



Last but not least, it would be nice to mention that we have put together a four membered developers' team, soon to be announced, ready to implement IAS non-local oriented projects, as well, a team we expect to see more from, in the near future. That is, after all, a great way to get more members involved with IAS, even ones that are not directly interested with the basis of IAS' technological interest, which mainly deals with energy topics, as students in this team are definitely interested in programming tools and useful applications.

IAS DUTH SBC ACTIVITIES

by Aristotelis Farmakis, DUTh SB IAS Chatper Chair

Finishing the year of 2015, our IEEE IAS Student Branch Chapter is happy, once again, to be able to have made a head start in this new academic year starting in October. Not one, but five (5) activities have already been organized, and this without counting the two (2) active participations in international Conferences, that of 2015 IAS Annual Meeting and the IEEE TISP in Athens (1st Mediterranean IEEE TISP Workshop).

So let's mention each experience briefly, in a manner of teasing you into viewing our full reports through the IAS CMD Newsletter.

On Monday October 26th, DUTh SB IAS Chapter and IEEE SB of Thrace organized a lecture on "All you want to know about studies in USA" at Elisso Hotel, in Xanthi. Prof. Ioannis A. Kakadiaris, was the main speaker of this event, a gifted Hugh Roy and Lillie Cranz Cullen University Professor of Computer Science, Electrical & Computer Engineering, and Biomedical Engineering at the University of Houston, Houston, TX, USA. He also holds an adjunct position at the School of Health Information Sciences at the University of Texas, Health Sciences Center, so as you can understand Prof. Kakadiaris is well in a position to analyze the above mentioned topic in full.

The conversation was flowing between our main guest and Dr. Nikolaos S. Sapidis (Professor in the Department of Product and System Design Engineering, University of the Aegean, Syros, Greece), also invited to help in raising important issues and successfully provide the audience with a sort of a "tour de table" conversation style. At the end, Prof. Athanasios Karlis and Prof. Ioannis Pratikakis linked that conversation with the Greek reality, giving students an insight of how relative studies approach works in Greece.

Soon after that speech, an important portion of our Chapter's active members' list was back form the 2016 IAS Annual Meeting, an amazing half-century of IAS celebratory gathering, both technically and networking – wise, after attending Oncor Microgrid educational trip and presenting both students' individual and Chapter's work. But let's not get carried away with Annual Meeting, , although we would really want to,

and continue mentioning the two (2) different style chapter presentations that were given by the administrative board of the DUTh IAS SBC. First one was on November 12th, 2015, when the established IEEE IAS Student Annual Presentation was given, as promised each year.

The concept, once again, an informing and welcoming presentation for all ages, undergraduate, graduate, master and doctoral students or generally anyone interested in supporting the work we do. A presentation of what DUTh SB IAS Chapter' vision is and the chapter's presence in the DUTh Community and campus. A great opportunity for freshmen and students not yet involved in our "extra-curricular" activities to listen to our ideas and realize our passion, embodied in our Student Branch.

But this year it was actually made clear to us, that newcomers interested in IAS needed more personal time with the active members. Time when they could get to meet us face to face, ask their own questions and thus get help in countering their hesitation regarding getting involved with something like the Institute of IEEE. It would, at the same time, be a great opportunity for the Chapter's members to showcase their work for the Chapter, such as the posters for competitions, the magazines and multiple other initiatives, the videos and promotional material and finally the chapter's activities themselves. This is why, on Thursday, November 19th of 2015, we organized this new type of event, our first "2015 Get Together", in order to give our annual chapter presentation a more unformal, and because of that, more personal approach in welcoming IAS first-timers.

However, in-between those two chapter presentations, were members had the chance to join or renew IAS subscription, we decided to organize a Chapter visit to one of the biggest solar parks in the Balkans (the largest one in Balkans consisting of Trackers) stationed outside of the city Kavala, a half an hour distance from Xanthi. Thus, on November the 17th, 2015, we organized a truly successful academic visit there, in order to learn about this state-of-the-art endeavor, and as it turned out, the entrepreneurial process of making it a reality.

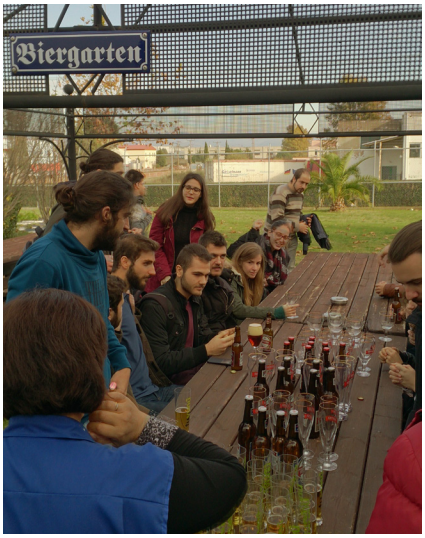
ABOUT US

An experience totally worth our time and effort, as the participants had a double gain. Not only did we get the chance to get technically informed about solar energy, solar parks and the process of the realization of such an investment, we also got a good grip of the Greek reality and energy market, from the investor and engineer himself, Mr. Michailidis and our advisor and good friend of his, Prof. Karlis.

Last but not least, on December 1st, 2015, we arranged for a guided tour of Macedonia Thrace "Vergina" Brewery, at the Komotini Industrial Area.

AS claimed by Vergina themselves, "The history of beer brewing in the Hellenic world is well documented throughout antiquity – perhaps most famously in the 10th Century Byzantine codex entitled "Peri Zython Pioiseos" ("On the Crafting of Beers") – furthermore, the ancient Greeks were well aware of the exceptional quality of the natural spring waters of Northern Greece, and archaeological finds confirm that Thrace was one of the very first locations in Europe where beer fermentation took place.". This is one of the reasons, along with Frank Zappa's quote regarding not being a real country, if you don't at least have a beer, that led to Vergina's first production and going on sale in 1998. Since then, Vergina has managed to build state-of-the-art production facilities and one of the strongest Greek Companies, one awarded with international prizes, one that produces eight (8) products: Vergina Premium, Vergina Red, Vergina Weiss, Vergina Porfyra, Edelsteiner, Stadelbrau, Prost and Hillas.

It is not exaggerating to claim that is was worth visiting as no place could better give us a chance to understand local productivity and market, as well as entrepreneurship with a vision and above all interdisciplinary collaboration of engineers and scientists of all sorts for the facilities to be ran in full. However, the greatest thing about this visit was the ending of it, as Macedonia Thrace Brewery offered us all of their products as part of beer testing and even allowed us to keep the official glasses in which the beers are to be drank, and thus offered us the chance to make a great social event out of this academic visit as well. Lots of students left the premises yelling that it was the best educational visit, Ever!



AWARDS AND CONTESTS 2015

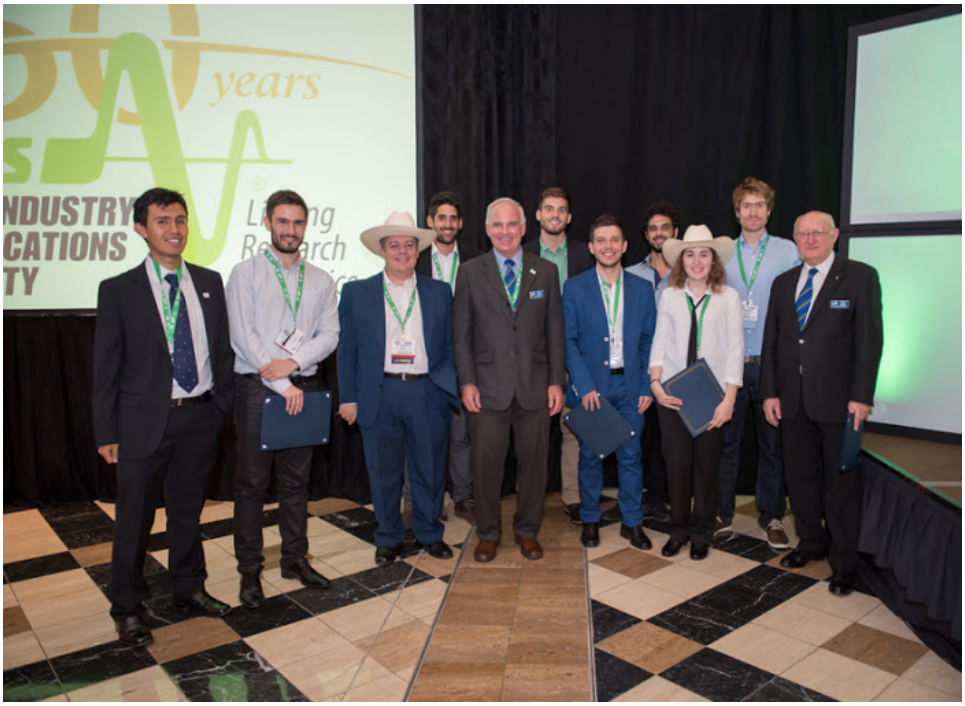
by Christina - Pamagiota Malliou, DUTh SB IAS Chatper Treasurer

Our Student Branch Chapter was founded in July 2012 and from the first day of our inauguration, we keep trying to improve ourselves and our Chapter in every way possible.

Following the remarkable course that we have those 4 years, we are proud to announce that during this year we managed to keep up the good work.

We organized a numerous events including meetings, lectures, workshops and educational trips. We updated our magazine Diploma and our new, fresh looking and as always user friendly webpage, which was presented during the IAS Annual Meeting 2015, will be up and running soon for all of our members to keep our members and everyone interested in our chapter's news constantly informed.

In addition to this, we always try to keep our members technically informed as much as possible while expanding their professional network. The best way to achieve that is by participating in international and national conferences. This year, 9 of our members attended three international conferences, the "IEEE IAS Annual Meeting 2015", the "IEEE Energy Conversion Congress & Expo", the "Central European Student and Young Professionals Congress" and one national workshop the "IEEE TISP Training Workshop in Athens, Greece".



ABOUT US

In order to acknowledge our efforts **Industry Applications Society** has rewarded us with the following awards for our activities:

- the "**2015 IAS Chapter Web Contest, 1st Prize Award**"
- "**The Most Happening IAS Chapter Contest 2015, 1st Prize Award**"
- **"50th Anniversary Video Contest, 1st Prize Award"**

In addition to this, **Mr. Kafalis Konstantinos, Dipl. Eng. received the 3rd place at the Graduate Student Thesis Contest 2015**.

At the **Myron Zucker Undergraduate Student Design Contest 2015**, our members **Emmanouil Bafounis-Kottas, Emmanouil Psomas, Antonius Simadopoulos** received the **1st prize award** at the Team Contest Category. At the Individual Contest Category our Chapter Chair **Aristotelis Farmakis** received the **shared 2nd prize award**.

Our past chair and CMD Chapter and Member Promotion and Support Committee Chair, Public Relations Subcommittee Chair Ms. Christina – Panagiota Malliou received the **"Outstanding IAS CMD Officer 2015"**.

We are all very proud that we have received these awards for our course in 2015! It was a great recognition for our efforts and our team work.

Congratulations to everyone!!

MODELING – SIMULATION OF AN ELEVATOR ELECTRIC DRIVE SYSTEM

by Konstantinos Kafalis, IAS DUTh SBC Member

Energy consumption is a very important factor of competitiveness among the elevator systems. Nowadays, buildings consume approximately 40% of the world's energy and the elevators are estimated to account between 2-10% of the total building's energy consumption. Thus, it is needed to find energy saving solutions. Nowadays, the most "green" elevator systems are gearless, and their inverter is controlled by VVVF (Variable Voltage Variable Frequency) techniques. My diploma thesis, which was presented and awarded during the IAS Annual Meeting 2015 deals with a mechanical elevator system, which uses vector control for driving the electrical motor and proposes a way to reclaim the regenerative power during motor's braking, in order to suggest solutions for decreasing energy consumption.

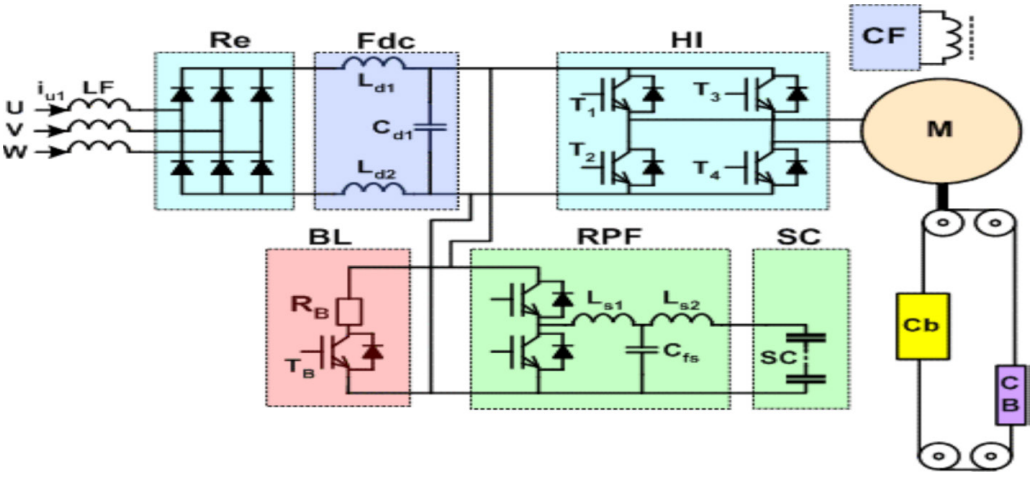
The first issue that we should deal with is to define a specific way that will measure an elevator's energy efficiency. There are 3 parameters that contribute to the consumption: The load, the trip distance and the usage frequency, which present a great variety of possible values and they affect the nominal power of the motor. Also each elevator uses energy in standby mode, which is consumed on the inverter

lamps, sensors and other electronic equipment. Because of all of this considerable diversity, the guideline 4707 creates a new measurement unit, the total specific energy consumption (mWh/kg•m), and according to the appearing below table, it recommends a classification guideline for the elevators.

Energy class	Specific energy demand in **mWh/(kg·m)**			
	Usage category			
	1	**2**	**3**	**4**
A	≤1.45	≤1.01	≤0.9	≤0.84
B	≤2.51	≤1.62	≤1.39	≤1.28
C	≤4.41	≤2.63	≤2.19	≤1.97
D	≤7.92	≤4.37	≤3.48	≤3.04
E	≤14.41	≤7.33	≤5.56	≤4.67
F	≤26.88	≤12.67	≤9.11	≤7.33
G	>26.88	>12.67	>9.11	>7.33

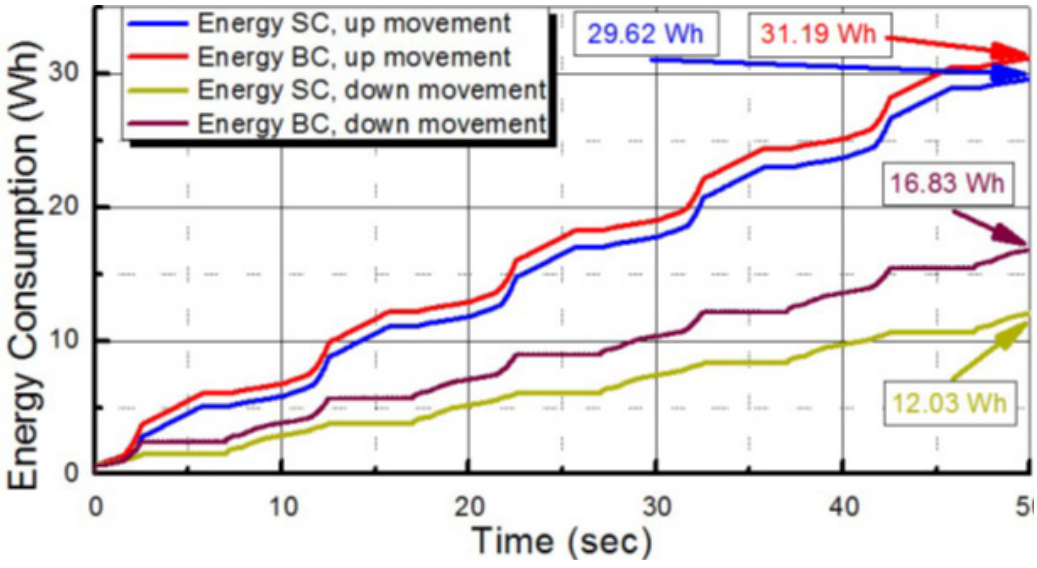
The induction machine is very common among the elevators. It's mainly used as a motor but during braking, cause of residual magnetic field and rotor's inertia, it is able to return power back for next usage. However, it would be very difficult to return this energy back to grid, because of the requirement of expensive equipment, the unawareness of the returning frequency, the problems of measuring and refunding of the reborn energy and many other problems that would be able to be produced related with the stability of the total grid. So it is recommended to use energy storages for this purpose.

Batteries characterized from high energy density, compact size and reliability but they present a big disadvantage. Their lifetime is rapidly reduced from high charging and discharging speed and in the presence of high current, so they can be considered as unsuitable for this application. On the other hand, supercapacitors have low resistance and this results to a high efficiency and they are appropriate in



low resistance and this results to a high efficiency and they are appropriate in applications with large burst of currents if they are controlled sophistically. So, the next topology is used to implicate the regenerative brake.

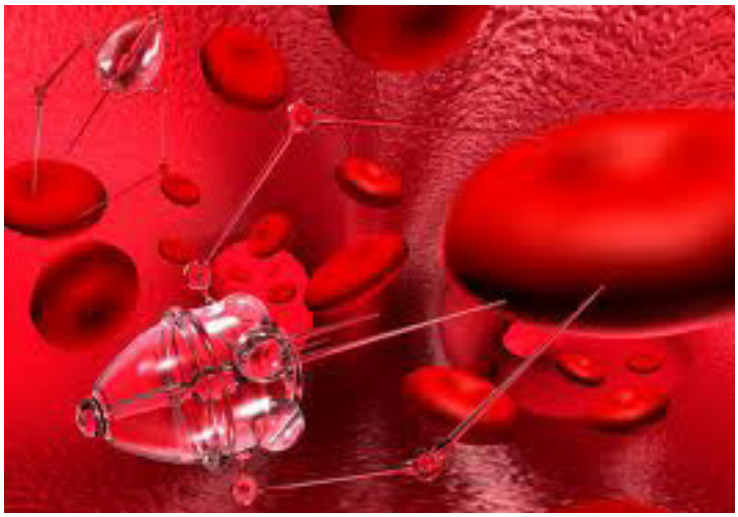
The last important topic is the motors driving system. There are many outstanding methods and the most common of them is the Variable Voltage Variable Frequency drive systems, known as VVVF systems. It is about a great group of methods and the chosen one for this thesis is the "stator field orientation", known as "vector control". The objective of vector control is to control the induction machine as if it was a DC machine with separate excitation, which is theoretically a standard source of variable torque (a common source to achieve different torque values). So the vector control, as its name implies, uses the involved quantities as vectors and is able to adjust their absolute value and their angle. This results in an excellent control of torque. Other advantages of vector control is that is adjustable at all range of speed and it can provide direct reliable position control but it is very complex and it requires known motor characteristics for good results.



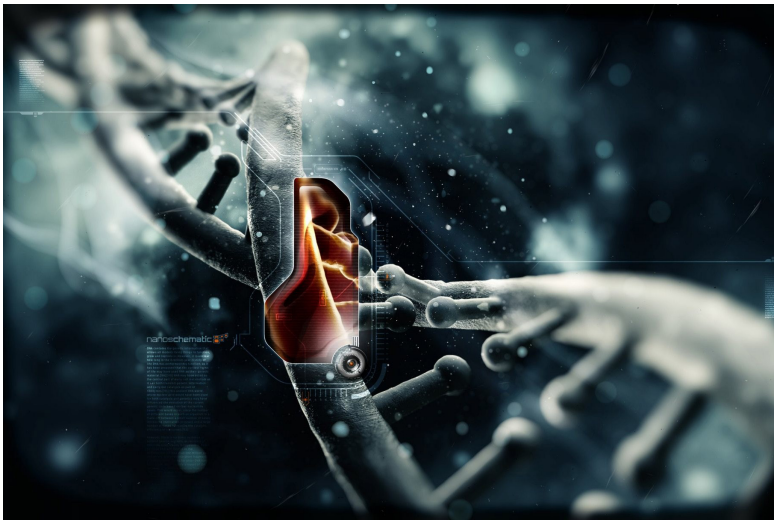
To conclude, a simulation has been created with the above characteristics to examine the results. As can be seem in the graph, it is easy to observe that this technique achieve great energy reduction up to 29% and the average reduction is about 12%. The application could have a great impact both to the industry and the domestic consumers if applied properly. It has the ability to significantly lower the use of energy resulting to more environmental friendly and economic solutions to the users.

REENGINEERING HUMAN BODY USING NANOTHECHNOLOGY

by Konstantinos Papatheologou, IAS DUTh SBC Member



Nanotechnology could change human biology forever. From prosthetic limbs and new burn treatments, to cancer detection and bones that heal in days or weeks, nanotech could be the future of medicine. Presently, nanomedical devices are normally made of unique sorts of nanomaterials like nanoparticles, solid or hollow nanoshells, nanotubes and empty nanospheres. The most advanced nanotechnology we have right now are the gold nanoshells, 100-200nm in diameter, which are solid silica cores covered by a very thin gold skin. They are currently used in experimental treatments against cancer.



In the future nanothechnology can be used to augment our brain chemistry by either conveying tranquilizes straightforwardly to our receptors (which can incorporate antidepressants, stimulants, or pain killers), or the more audacious approach of improving our idea pattens and memory by effectively assembling and repairing neural tissue. All things considered, things like

emotional instability, cerebrum wounds and brain injury could be, finally, overcome. Furthermore, there's a lot of improving: our hearts, lungs, fortifying our bones, repairing muscle tissue, upgrading our eyes, reflexes, quality, endurance.

Although nanotechnology can improve our lives, it can be pretty dangerous too. First of all, anything that can be utilized for good can likewise be utilized for shrewdness. It is not unbelievable that a rebel organization could utilize nanotech to perpetrate any number of wrongdoings, including homicide, to accomplish a particular end. Also, this technology could not be effective. Since many expectations we have for nanotechnology are based on concepts developed by futurists and fiction writers, we could end up with a reality much different than what we expected. Finally, there could be some unintended health consequences. The human body has a surprising capacity to react to intruders. Nanotechnology would be viewed as an intruder and white blood cells could assault the tech. Smothering the immune system or nanotech experiences with WBCs could have unforeseeable and unintended outcomes.

In conclusion, nanotechnology could change the world in dramatic ways. By weighing the pros and cons of this tech, we can each determine if this is a field of research to be supported. There’s really no limit to what programmable nanomachines could do, once the technology was realizable of course. And above all, proven to be safe and effective. And since it would mean that human beings no longer would be subject to disease or degenerative conditions, lives could be extended indefinitely, which is part and parcel of the whole “transhuman”, “posthuman” and “postmortal” concept.

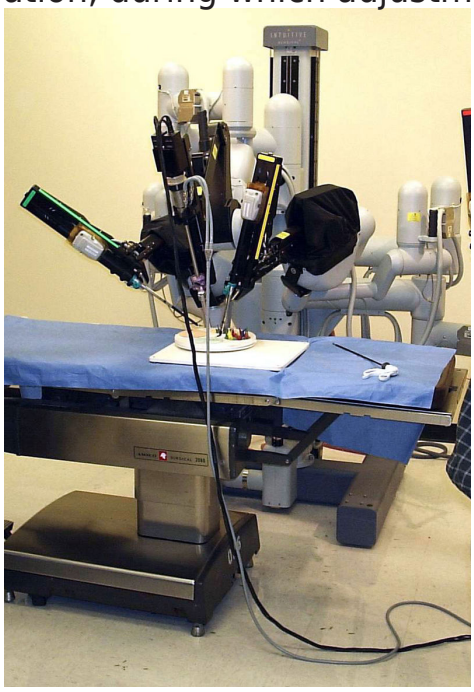
ROBOTIC APPLICATIONS IN MEDICAL SCIENCE

by Dimitrios Barmperis & Loukas Kottas, IAS DUTh SBC Members

The continuous and rapid advancement of robotic science has had a severe impact in medical practice, transforming traditional medical routine. Robots made their first appearance in medicine in 1987 by performing the first laparoscopic surgery, a cholecystectomy. Since then, several medical methods have been developed with the aid of robots. These new methods have significant advantages in comparison with older methods, by being minimally invasive, as incisions are smaller, recuperation time is shorter and the risk of infection has almost been diminished. Typical examples include modern robotic surgical systems like da Vinci Surgical System and robotic limbs like prosthetic missing body parts.

Robotic Surgical Systetms

There are three main types of robotic surgical systems, Supervisory-Controlled systems, Tele Surgical systems, Shared-Control systems. Supervisory-Controlled systems, are pre-programmed by the surgeon to perform a very specific surgical operation, during which adjustments can not be made. Thus, this type is considered to be the most automated one. Shared-Control systems differ from Supervisory Controlled-systems, because the surgeon maintains the primary role during the operation. This kind of systems have a supporting role, aiding the surgeon to prevent any errors. Tele Surgical systems stand out because the surgeon performs the whole operation himself by guiding robotic arms in real time. That is why the last category has the most practical applications.



One of the most prominent Tele Surgical systems is da Vinci. Da Vinci is made by the American company Intuitive Surgical and was approved by Food and Drug Administration (FDA) in 2000. It has a large number of clinical uses, which include common

operations like gynecologic, cardiac surgical procedures and prostatectomies. The da Vinci System consists of two discrete parts, a surgeon's console and a patient-side cart. The patient-side cart consist of four interactive robotic arms that are controlled from the surgeon's console, three of which are for tools that can hold objects or can act as some common surgical tools, like lancets. The surgeon remotely controls these four robotic arms having no physical contact with the patient. The image that surgeon sees at the console has no significant difference from reality, as the unique 3D vision system can magnify the operation area ten times its normal size. The robotic arms are specifically designed in order to extend the natural range of motion of the human hand, with motion scaling and tremor reduction refining even more the surgeon's hand movements. The da Vinci System also includes various other safety features engineered to minimize human error possibility. The da Vinci System has numerous more advantages when compared with conventional approaches, for example, the surgeon can operate from a seated position at the console, having eyes and hands positioned in line with the instruments and the controls.

Robotic Limbs

In 1945 the National Academy of Sciences, in the United States of America, established the Artificial Limb program to respond to the numerous veteran amputees of World War II. Since then, robotic advancements have induced radical changes at prosthetic limbs' functionality.

There are several advanced ways to control a prosthetic limb. One way, the so-called myoelectric, is by listening to muscles that continue to exist in the residual limb - the remaining limb - and which the patient can voluntarily contract. When muscles contract, they generate small electrical signals that can be detected by electrodes placed on the surface of the skin. Another more advanced method is targeted muscle reinnervation (TMR). In this technique the amputated motor nerves that used to control the muscles on the amputated limb are surgically redirected

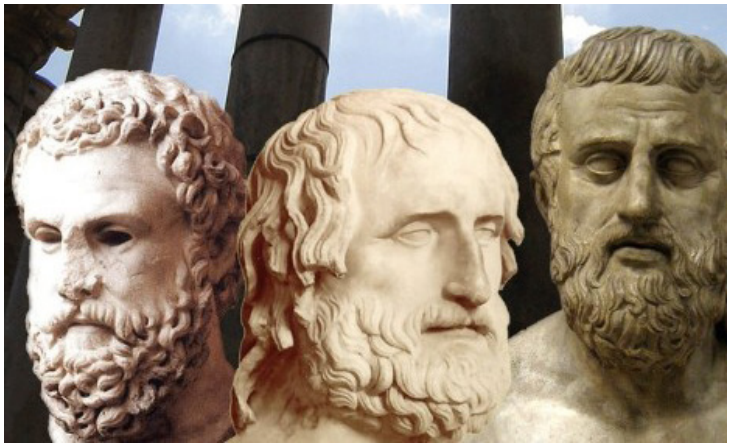
to control a small portion of a large intact muscle, elsewhere in the body. For instance, the same nerves that previously controlled the patient's arm might be rerouted so that they reinnervate a small area of the chest muscle. After this procedure, when the patient thinks about moving his amputated arm, a small region of his chest muscle will contract instead. These contractions can be detected by appropriate sensors and used to control movement of the prosthetic device. A third even more advanced method is by using neural interfacing technology, in other words by listening and communicating directly with the brain and nerves. For example, microscale electrodes can be implanted in the brain to intercept motor command signals, such that when a patient tries to move his missing limb these signals are used to control the prosthetic limb.

ANCIENT GREEK TRAGEDY THE CORNERSTONE OF MODERN THEATRE

by Ioanna Boutziona, IEEE SB of Thrace Secretary
and Christina - Panagiota Malliou, DUTh SB IAS Chatper Treasurer

Ancient Greeks used **drama as a way of investigating the world they lived in**. There are three genres of drama: comedy, satyr plays, and most important of all, tragedy. **Greek tragedy and Greek comedy formed the cornerstone of modern theatre.**

While comedy was mainly a way to mock men in power for their vanity and foolishness and satyr plays on the other hand were short plays performed between the acts of tragedies that made fun of the plight of the tragedy's characters, **tragedy dealt with the big themes of love, loss, pride, the abuse of power and the fraught relationships between men and gods.**



Tragedy is a form of **theatre with poetic elements,** which was originated from Ancient Greece and it reached its most significant form in Athens in the 5th century BC. Although, the tragic plots presented in Greek tragedy were **based on myths** from the oral traditions of archaic epics, they were **presented by actors**. **The most important playwrights** of Greek tragedies were **Aeschylus, Sophocles and Euripides.** Many of their plays are still being performed even today.

The origin of Greek Tragedy

The exact origin of Greek tragedy **remains still unknown**. Some scholars believe that Greek tragedy started in Athens as **a lyrical performance of epic poetry**. Others believe that tragedy is **an extension of the ancient rites carried out**

in honor of Dionysus, **the God of Theatre.**

According to Aristotle, one of the greatest ancient Greek philosophers, tragedy is **the highest form of artistry**. Aristotle thought that it is a way for people to **express their actions on scene**. On the other hand, **for Plato, Aristotle's teacher** and yet another great Greek philosopher, tragedy was so**mething different. It was a way to imitate the feelings from human affairs (mimesis)** and the actors had to imitate those feelings.

The structure of a tragedy play

The structure of an ancient tragedy is usually separated into **three parts: the prologue**, the beginning in which the drama and the background was explained, **the parodos**, the middle part that allowed for the story to unfold in three or more episodes and the exodus, **the end of the tragedy** that concluded the story.

One of the main characteristics of tragedy, besides the feelings' imitation is **catharsis**, **a certain emotional cleansing of the spectator**. Although catharsis is yet to be defined, in most cases it refers to **the overall ethical benefit coming from the intense and at the same time fulfilling experience**. That is the reason why Greek tragedy must be at a **specific size allowing the spectators to consolidate the meaning of the play**. The character of the tragedy should not be unimpeachable or excellent. He should be **an ordinary man, with all the character variations of human nature**.

As Ancient Greek tragedy dealt with moral right and wrongs, **violence was not permitted stage**. Even **the death of a character was not allowed to be seen** and it had to be heard from offstage. In addition to this, **the poet was not allowed to make comments or political statements through the play**. This gap was to be filled later by a less strict form of play, the Ancient Greek Comedy.

At the early years of Ancient Greek tragedy, **the plays**, which started in the morning and ended in the evening, **had only one male actor,** who performed wearing a costume and a mask. The actor was speaking to **Corypheus, the leader of chorus,** a group of 12 to 15 actors that was only allowed to sing and dance. Eventually, **the number of actors was increased to three,** no matter how many characters were in the play. Each

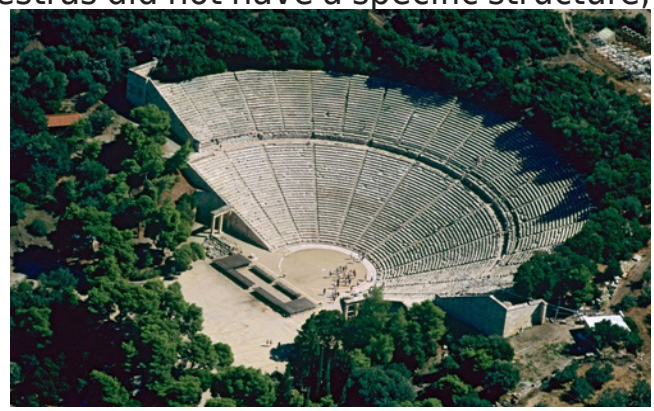
actor, after playing one character had to switch his mask and his costume and then reappear on stage as a different character.

The Ancient Greek Theatre

Attending an Ancient Greek tragedy had nothing to do with today's performances. In 5th century BC, Ancient Greek plays were performed in an outdoor open-air theater, called theatron. The basic layout and the parts of a Greek theatron was always the same even as the theatres were evolving.

The orchestra, the theatron, the skene and the parodos

The **orchestra** was a circular, level space where the chorus dance, sing and interact with the three actors. While the earliest orchestras did not have a specific structure, eventually they got paved with marble. In the center of the orchestra there was often an **altar**. The average diameter of the orchestra was 25 m or 80 feet. The orchestra was situated on a flattened terrace at the foot of a hill, taking advantage of the natural slope.



The spectators sat at the **theatron**, the part of the hillside with a view of the orchestra. During the 5th century BC the theatres had wooden seats but as they were evolving many Greek theatres appear to have **marble seats**. The theatron was able to accommodate a large number of people in the audience, up to twenty thousand.

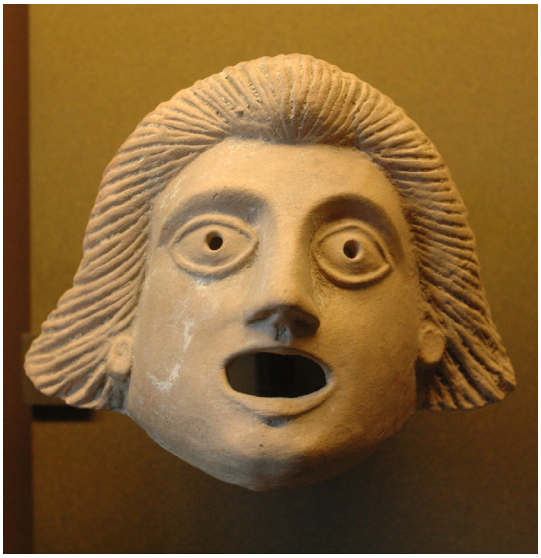
In 465 BC, the playwrights began using a backdrop, which stood behind the orchestra. This area also served as an area where actors could change their masks and costumes. It was known as the **skene** and it is the word from which the word "scene" derives. At this part, the death of a character is announced to the spectators.

Greek theatres also had tall arched entrances called **parodos or eisodos**, through which actors and chorus members entered and exited the orchestra. Before the beginning of the play, the audience also used them to enter the theatre.

Although at the beginning, the term theatron was used only for the "viewing part" of the theatre, later it included both the theatron, the orchestra and the scene.

Engineering in Ancient Greek Theatres

Mathematics and engineering played a huge role in the construction of these theatres, as their designers had to be able to create acoustics in them such that the actors' voices



could be heard throughout the theatre, including the very top row of seats. The Greeks had a great understanding of acoustics that could comparable with the current state of the art.

Mechane was a **crane** used in Ancient Greek theatre. It was made of wooden beams and pulley systems and it was used to lift an actor into the air, usually representing flight. This stage machine was particularly **used to bring gods** onto the stage from above. **This Greek engineering mechanism gave the Latin term "deus ex machina"** and it was used in Ancient Rome during the sometimes highly dramatic performances at funerals. **Euripides' use of the mechane in Medea is a notable use of the machine for a non-divine character.**

Ekkyklema was a **wheeled platform** rolled out through a skene. It was used to **bring interior scenes out into the sight of the audience**. It is mainly used in tragedies for **revealing dead bodies**, such as the corpse of Eurydice draped over the household altar in Sophocles' Antigone.

Dramatic competition

Ancient Greek dramatic competitions were performed either **at the end of March approximately**, at the **Great Dionysia** either at the **end of January and the beginning of February** during the **Little Dionysia**. These competitions were organized by the state that was responsible for **the selection of the poets, the sponsors,** who covered the expenses for the performances**, the competitions' judges, the award ceremony and the inscriptions**. From all the submitted plays only **one satyr play and three tragedies** were selected. The **Ekklesia**, the principal assembly of the democracy of ancient Athens, presented the awards to the **winner poets that where selected by five judges**. In addition to this, all plays along with the poets, the actors and the sponsors of each play were recorded in order to keep the public records.

Ancient Greek tragedy is a kind of a tradition for us Greeks and it **has heavily influenced the theatre of Ancient Rome and the Renaissance**. We try to keep alive the meanings that grow at the play and the culture that was left to us from our ancestors.

HONDA'S SMART HOME TO PAVE THE WAY TO THE HOME OF THE FUTURE

by Adamantios Bampoulas, DUTh SB IAS Chatper Member

The University of California and automaker Honda team up on a concept that explores energy efficiency and emerging green technology in a residential context.

In the West Village neighborhood of Davis, a college town located 15 miles west of Sacramento, teams at Honda and UC Davis kitted out a 1,945-square-foot house with experimental and on-the-market technology to accomplish net-zero energy consumption. With smart home concepts continuing to build momentum, the definition is steadily becoming refined but is still open to interpretation. Although smart-home demos often focus on gadgets, the 'smart' in Honda Smart Home refers to an intense focus on energy efficiency, energy management, and sustainability.

Producing renewable energy is one step to making a home sustainable. The key component of this effort is the Home Energy Management System (HEMS). This system monitors the electrical load, maximizes efficiency and minimizes carbon. The system is able to communicate with the electrical grid so that the house power can coordinate with the needs of the grid. From an environmental view point, solar power and battery electric vehicles (BEVs) are transformative technologies, so the play a critical role in the smart home. However, further penetration of these technologies in everyday life requires reducing strain levels on the grid.

The Honda Smart Home can produce as much as 9.5kW DC power from the photo-voltaic arrays on the roof and the HEMS can take that DC power and either use it directly to charge the stationary storage battery or take the DC energy and put it into a plug-in battery electric vehicle or if the grid wants it and its convenient can take that, turning the AC power and send it back. Thus, the BEV can be recharged by a DC charge cable through solar power.

One of the big challenges of introducing renewable energy and electric cars into the electricity mix is that solar power is intermittent. In other words when clouds pass over the sun, the power drops away; in addition, plugging in electric cars can be an unpredictable load on the grid. So, keeping the supply-and-demand of electricity perfectly in balance with electric grid becomes more difficult. The battery is a high efficiency lithium ion battery. The key features of a storage battery is that it needs to have a very high efficiency of charge/discharge energy going through it, in order to retain more of the energy that has been generated and stored in the battery.

The HEMS supplies power to the grid when the grid is overstressed or takes that excess power to store it in the battery or charge the BEV when the grid has surplus power. The great value of a system like this is that it can calculate when to buy and sell power buying at low carbon times and selling at high-carbon times. The HEMS will perform those detailed calculations by “listening” to the grid, measuring the sunshine and “understand” how much electricity is needed both for the BEV and also the storage battery.

Finally, the scope of this project is to design a home that uses as little energy as possible to supply the home integrating the transportation with the home in way that is fundamentally a good use of energy. Energy production and consumption are actively coordinating with the electrical grid to help enable a future with more electrified vehicles and more renewable energy.

CEUSYP 2015

by Dimitra Chatzichrysoui, DUTh SB IAS Chapter Secretary

Last May (8 - 10 May 2015) I attended the Central European Student and Young Professionals Congress in Zagreb. The congress was well organized and the organizing team had done an amazing job. I really enjoyed the plenary sessions about IEEE in general because I had the chance to learn more about the activities of Region 8. Moreover, the workshops in robotics and in presentation skills were really useful. I also had the opportunity to win a book in a lottery about TED presentations from the presenter of that workshop Margaretha Eriksson. In addition, on the first day we had a city tour in order to learn more about Zagreb and its history. Probably, one negative fact was that sometimes participants and organizers were speaking at their own language and not in English.

Moreover, we had the chance to promote IAS. It was the first time for me doing something like that. I tried to inform people about IAS, our actions and of course to promote the free membership. They, also, had a great interest for the IAS printed material.

The "IEEE Central European Student and Young Professionals Congress 2015" was a great experience for me, I had the chance to learn more about IEEE, attend some interesting workshops and of course get in touch with other cultures.

After all, events like these are a great place to learn everything you ever wanted to know about IEEE, other student branches and young professional affinity groups, to make new international contacts and friendships, and to do it in the most fun and catchy way.

IAS ANNUAL MEETING 2015

by Christina - Panagiota Malliou, DUTh SB IAS Chatper Treasurer
and Adamantios Bampoulas, DUTh SB IAS Chapter Member

The Annual Meeting has a long tradition **of providing an international forum for experts to present and discuss the latest developments in the application of electrical technology to industry**. Our Chapter, DUTh SB IAS Chapter, from the first year of its inauguration **has been represented every year in the IEEE IAS Annual Meeting**.

During the **50th IAS Annual Meeting held in Dallas, Texas, our chapter's members** (Emmanouil Bafounis, Diamantis Bampoulas, Aristotelis Farmakis, Konstantinos Kafalis, Christina - Panagiota Malliou, Emmanouil Psomas and Antonis Simadopoulos) that were supported by the **Annual Meeting Travel Grand Program** and the **Myron Zucker Design Contest** and our chapter's advisor Prof. Athanasios Karlis had the chance to attend an **exceptional technical program as well as a variety of very interesting cultural events**. Although our trip to Dallas was long and tiring the Annual Meeting was worth it. It was a **great opportunity for all of us to meet new people from all over the world, to learn more and to gain more experience**.

The first day, as always, was dedicated to the CMD Workshop. During this workshop the CMD Officers presented this year's work informing all

students about the **endless possibilities within the scope of IAS**. In addition to this, the **Area Chairs, the Chapters Chairs and the Student Branch Chapter Chairs presented their past and upcoming activities** as well as the progress made over time. Our Chapter Chair, **Mr. Aristotelis Farmakis, presented the new version of our webpage that will be up and running within 2016**. Besides this presentation, **the conference attendees received the 5th, anniversary issue of Diploma**.

In addition to the presentation the **Outstanding Officer Awards were presented during the CMD Workshop**. Our treasurer and CMD Chapter and Member Promotion and Support Committee Chair, **Ms. Christina Panagiota Malliou along with Ms. Megha Tak,** YPP Committee Chair were awarded as the **Outstanding IAS Officers for their contribution** during this year.

A group picture with all the participants was taken at the end of the Workshop.

In the afternoon the **Welcome Reception took place along with the Student Poster Session**. All of our representatives **presented their work and received feedback from the attendees that they will use in the future**. All students that participated received **“Certificates of Appreciation” for their efforts.**

During the second day, some of our members attended the **Student Technical Session,** where they made **oral presentations about their technical papers and answered questions about their projects**. During the Student Technical Session our member, **Mr. Konstantinos Kafalis**, presented his **diploma thesis titled "Modeling – Simulation of an Elevator Electric Drive System"**, which received the **3rd Prize Award** After our presentations we attended some other very **interesting presentations and were intrigued by other people's work**!

Bafounis, Mr. Emmanouil Psomas and Mr. Antonios Simadopoulos received the **Zucker Undergraduate Design Contest Team Category 1st Prize Award** for their project "**Design of a Savonius Wind Turbine**", while our Chapter Chair **Mr. Aristotelis Farmakis** received the **Individual Category 2nd Shared Prize at the same contest** with his project "**IASpass**".

We also attended the **Muron Zucker Student Luncheon**, where we were informed about **Myron Zucker and his enthusiasm about electrical engineering that lead to his decision to support Electrical Engineering students providing the available travel grants**. During the Zucker Luncheon our chapter's members **Mr. Emmanouil**

Moreover, we attended the **CMD Dinner, where Dr. Peter Magyar and Mr. Dave Durocher presented the chapter awards**. **Our Student Branch Chapter received a great number of awards**, including the **1st Prize Award as voted by the student branches for the Anniversary Video Contest**, the **Chapter Web Contest 1st Prize Award** and the **Most Happening Chapter 1st Prize Award**.

We were very **excited to participate and attend the cultural performances that took place this year for the first time** during the CMD Dinner.

On the third day, some of our members participated at the **Oncor Microgrid Tour**, **the largest regulated distribution and transmission system in Texas and the sixth largest in the United States**. The tour schedule included a visit to the immersion room, the control room and an on-site visit to the facilities, so that attendees can obtain comprehensive information on the activities of the microgrid. The participants had the chance to learn about the **feasibility and utility of a microgrid, the history of the grid and the technology that it uses.** They also had the opportunity not only to see **the real time energy management of the microgrid but also learn about how it is implemented**. Last but not least, the attendees got to visit some of **the microgrid plants, such as the solar photovoltaic arrays, the microturbine and the energy storage system**.

On the fourth day, some of our representatives attended some **energy system presentations** while the others were attending **the power system engineering session**. One of our members, **Ms. Christina Panagiota Malliou presented her paper "The effect of water droplets and salinity on the offshore wind turbines windings insulation: a short review"**.

In the afternoon most of our representatives attended the power system protection session, a field very interesting for all of our students. In the evening, the representatives attended the President's Banquet where some more awards were presented and we were informed about **the next Annual Meeting that will be held in Portland, OR, USA.**

This Annual Meeting was an unforgettable experience for all of us and we sure hope to get the chance to participate at the Annual Meeting as well!

GETTING CONNECTED

by Mamos Bafoumis - Kottas, IAS DUTh SBC Member

When I started thinking what I should write in the introduction of this column, the first thing crossed my mind is to do a list of all the typical and common reasons why someone should get connected. Like:

•Exchange knowledge.
•Enhance your professional network.
• Meet new people and make new friends.
•Travel and meet new cultures and mentalities.

It is definitely all these, but luckily it is also a lot more.

Societies and organizations like IAS, offer generously all the above, but the most important tool you acquire is **to be and stay creative**. In a world that life runs faster than us and technology is evolving rapidly, creativity is the only way to stand out. Developing your ability to **think "out of the box"** is not something easily achieved, but it is for sure essential. It is a path to develop and unfold your full potential as a person despite the failures along the way. In the end it is worth the trouble, not only due to the **evolution** of the individual skills of a person, but his **intellectual growth**, as well.

But almost nothing can be achieved without **unity and teamwork**. We need to cooperate to achieve our goals, so just imagine what could happen if we could **combine all this creativity**. Imagine **people exchanging ideas** to solve mutual problems and improve their quality of life. Imagine different aspects and points of view **communicating effectively**. Imagine **opening new, better horizons for the world**.

Fortunately you do not have to use your imagination. It is happening. **Organizations like IAS make it happen.** Wouldn't be a shame if all this creativity got wasted?

Don't miss the chance to make the world a better place. Get connected.

UNIVERSITY OF STRATHCLYDE GLASGOW

by Tariq Mir and Yanni Zhong University of Strathclyde IEEE IAS/PELS Joint Chapter

Strathclyde SB chapter was founded on 5th November 2015, which is the first IAS student branch chapter in UK. Strathclyde are committed to the application of our knowledge to provide real world solutions to current market challenges. By building a strong foundation upon the practical nature of the IAS and PELS networks we will focus on producing a more marketable graduate from our students and more rounded postgraduate researchers with industrial applications experience. This will also help further the research careers of the postgraduate researchers.

We wish to share our enthusiasm for our subjects and be invigorated by the dynamic energy of other participants. As active participants we are all co-evolving and this interdependency is at the core of our values here at the Strathclyde IAS / PELS Student Branch chapte. Universal brotherhood and sisterhood linked together through our warm community and shared visions.

For less than two months, the chapter has grown rapidly from 24 members to **56 student members and also held two successful events**.

The IAS CMD chair Dr. Peter Magyar came to Glasgow for the official **inauguration meeting** on 20th November 2015. IEEE Strathclyde Univ Student Branch Counsellor Dr. James Irvine gave an opening speech, followed by the official inauguration made by Dr. Peter Magyar. The IEEE and Region-8 overall presentation was made by Prof. T. Durrani. Afterwards, IEEE Region 8 Past Director Prof. A. Davis made an in-depth analysis of UKRI Section and Region-8, and also had an impressive speech about his life and the important decisions he had to make during his career. Thereafter, UKRI Section IAS chapter Chair and Co-Chair Prof. A. Hussain and Prof. M. Grimble talked about the UKRI Section IAS Chapter. The meeting ended with Dr. P. Magyar's IAS Overview and Yanni Zhong's IAS Chapter Annual Meeting impressions.

Thanks to Dr. Peter Magyar's great support, the inauguration was very successful. We learnt about what is IEEE and IAS. We are also inspired by the life story of Prof. A. Davis about the importance of making decision at each stage of our life and willing to volunteer up.

On 4th Dec 2015, our Chapter attended an event delivered by the **Energy Technology Partnership (ETP)** and built powerful links with ETP. All our members will benefit from unlocking these links between industry and academia. No matter we are undergraduate, masters or doctoral student, as long as we have expertise related in the nine electrical engineering related themes which includes Energy Conversion and Storage, Marine Energy, Power Systems and Networks, Wind Energy, Solar Energy, Oil and Gas and so on. We can all get involved.

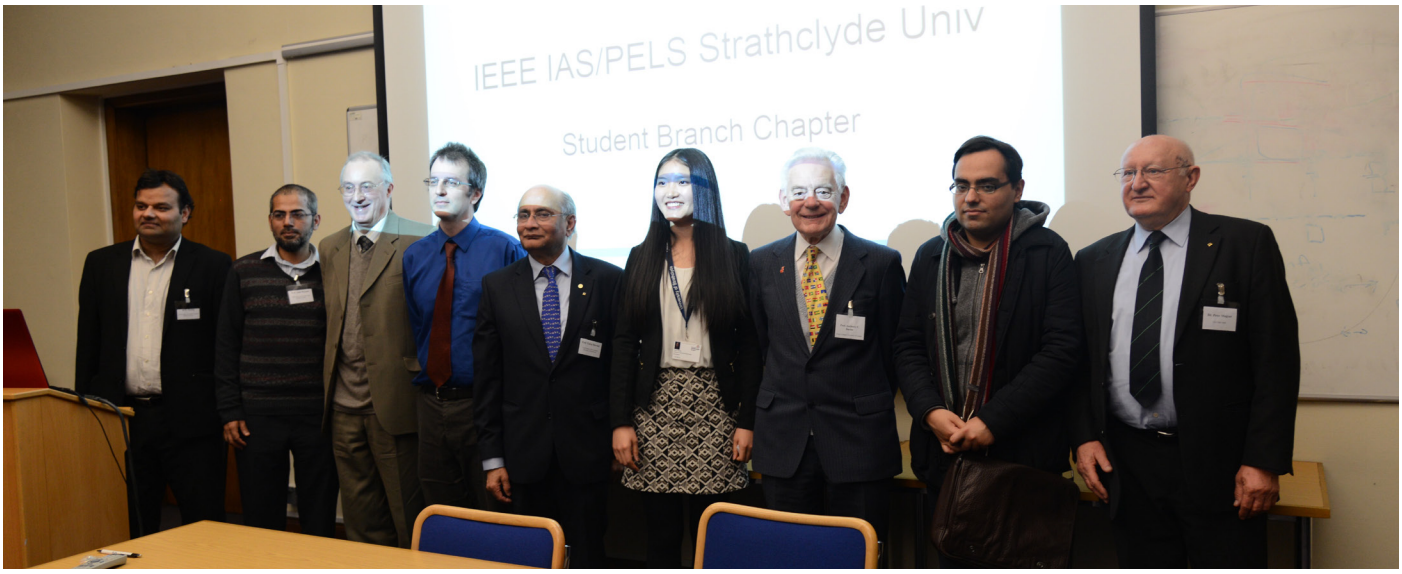
We will be responsible for organising and managing activities, promotions, competitions and conferences which will attract students, academics/professionals and keep them active participants. We will empower our members so they can develop their professional qualities further. We will resource leaders in academia and industry that will raise our mobility within the IAS and PELS networks. A further aim also is to make the transition from student member to IEEE young professional easier and hence provide a seamless continuity of personal development.

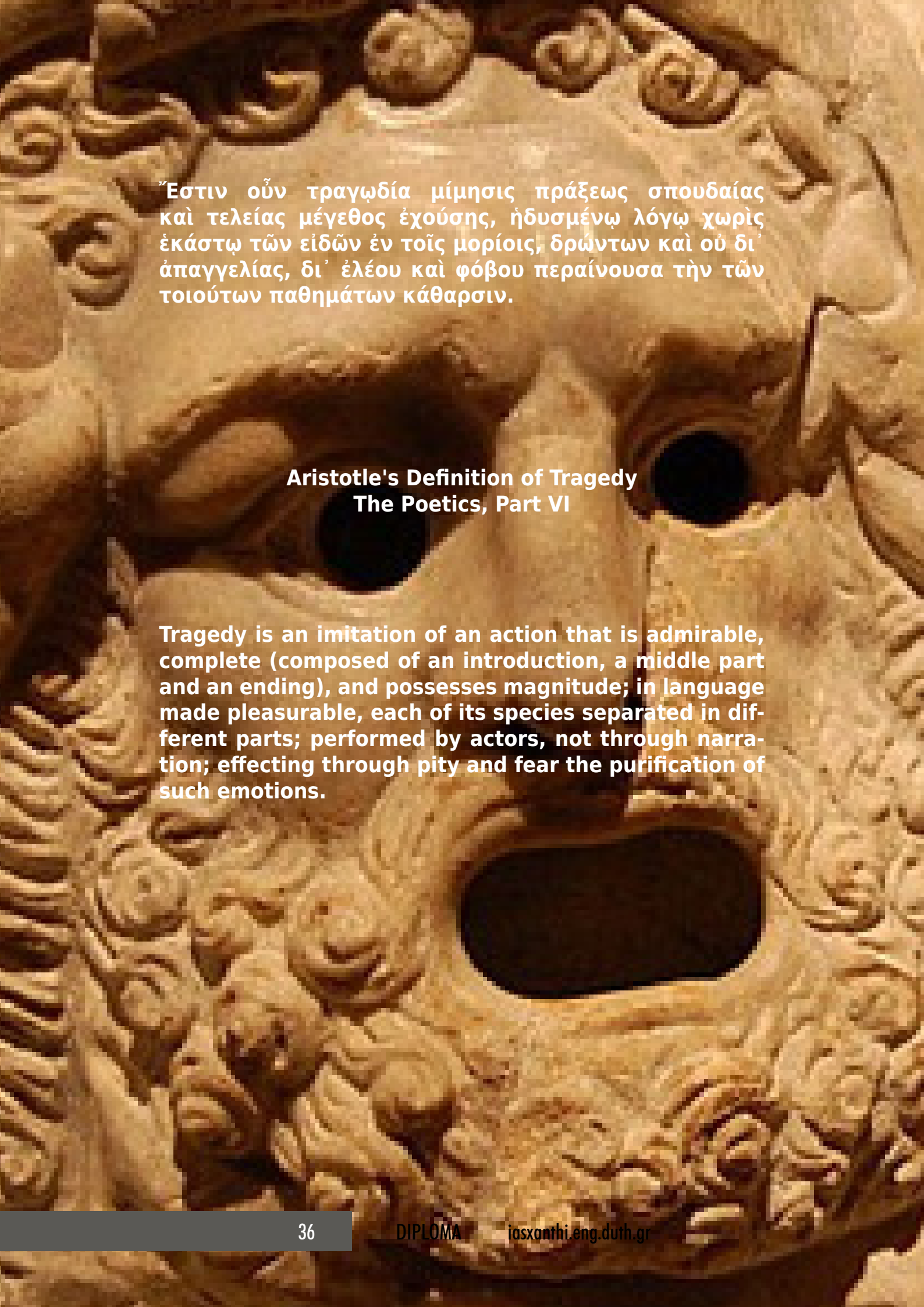
Our network currently in its expansion phase and as part of our programme we will be inviting scholars and professional (**distinguished lecturers**) to feed into our exciting new programmes here in Glasgow.

Organising tours of local companies, research labs, industrial sites, arranging for industry support of our student branch and chapter projects. **Visiting trips** to PNDC/ Scottish Power/ Wind Farm will be conducted during March-May 2016.

We are already laying the foundation for a flagship **Power and Electronics conference in Scotland (PECiS) 2016**. This will give students the opportunity to network with our peers and develop friendships with leaders in the fields. We at Strathclyde are very excited to being a part of the IAS and PELS networks. We look forward to communicating and cooperating with chapters worldwide and also looking forward to seeing you at our PECiS conference. Further details will be noticed on our webpage.

Chapter Chair: Yanni Zhong (yanni.zhong@strath.ac.uk)
Chapter Advisor: Prof. Stephen Finney (stephen.finney@strath.ac.uk)
Chapter Website: https://www.facebook.com/IAS.PELS.StrathUni/





Ἔστιν οὖν τραγῳδία μίμησις πράξεως σπουδαίας καὶ τελείας μέγεθος ἐχούσης, ἡδυσμένῳ λόγῳ χωρὶς ἑκάστῳ τῶν εἰδῶν ἐν τοῖς μορίοις, δρώντων καὶ οὐ δι᾽ ἀπαγγελίας, δι᾽ ἐλέου καὶ φόβου περαίνουσα τὴν τῶν τοιούτων παθημάτων κάθαρσιν.

Aristotle's Definition of Tragedy
The Poetics, Part VI

Tragedy is an imitation of an action that is admirable, complete (composed of an introduction, a middle part and an ending), and possesses magnitude; in language made pleasurable, each of its species separated in different parts; performed by actors, not through narration; effecting through pity and fear the purification of such emotions.