



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

DEPARTMENT
OF GEOSCIENCES

DEPARTMENT SELF-ASSESSMENT

by

the Head of the Department (Domenico Rio)

This report is responsibility of the Head of the Department. It has benefited of the help of programme coordinators, Luca Capraro, Alberto Dal Negro, Edda Fassari, and Daria Pasqual. Fabrizio Nestola deserves a special mention for his most helpful attitude.

	DEPARTMENT SELF-ASSESSMENT
1	DEPARTMENT OF GEOSCIENCES (DG) The Department of Geosciences (DG) was established in 2006 and unifies the former Department of Mineralogy and Petrology (DMP) and Department of Geology, Paleontology and Geophysics (DGPG). It became fully operative January 1, 2007. Currently (July 2008), the number of Faculty members is 45: 42 Faculty staff of the DG are members of the Faculty of Sciences, 2 are members of the Faculty of Agronomy and one of the Faculty of Engineering. The DG also includes other 32 Administrative and Technical staff. In addition, the DG host an Emeritus Professor, seven Researchers of the CNR “<i>Istituto di Geoscienze e Georisorse</i>” associated to the DG, and large group of external research collaborators (including a significant number of 25 graduate students). The DG offers courses for degrees of first (“<i>Laurea</i>”) and second level (“<i>Laurea Magistrale</i>”) mainly awarded by the Faculty of Sciences (degrees in Geological Sciences, Natural Sciences, Environmental Sciences, Cultural Heritage). A few courses are offered for the Faculties of Engineering, Agronomy, and Liberal and Human Arts. The DG hosts two Museums, presently not open to the public: the Museum of Geology and Paleontology and the Museum of Mineralogy. It should be noted that the former DMP has been evaluated by an external panel in 2005 (for the period 2000-2004). The results of this evaluation are reported in the Attachment DG-1.
2	SUBJECTS OF STUDY/DOCTRINES In the Italian University System the subjects of study of the DG are all but one included in disciplinary area 04 (Earth Sciences) which includes 11 sub areas (referred to as “<i>Settori Scientifico Disciplinari - SSD</i>”, labelled from GEO-01 to GEO-12). Research in the DG is focused on many aspects of Geosciences and disciplines represented in the DG with reference to the Italian “<i>Ministero dell’Università e della Ricerca scientifica</i>” (MIUR) taxonomy are the following: GEO-01: Paleontology, Micropaleontology, Paleoclimate GEO-02: Sedimentary Geology, Stratigraphy, Regional Geology, Sedimentology GEO-03: Structural Geology, Tectonics and Geodynamics GEO-05: Hydrogeology, Applied Geology GEO-06: Mineralogy GEO-07: Metamorphic and Igneous Petrology GEO-09: Cultural Heritage and Ore Deposits GEO-10: Topography and Geodesy GEO-11: Applied Geophysics. Faculty staff of SSD GEO/04 (Physical Geography) are hosted by the Department of Geography. Recently (2008) we have hired an Assistant Professor of the SSD ICAR-02 (Hydrology; disciplinary area 08 - Civil Engineering and Architecture). Presently, 51 scientists of the University of Padova (UP) belong to the MIUR disciplinary area 04 (Earth Sciences) and 45 of them are noteworthy members of the DG.

3	FORMAL COLLABORATIONS AT LOCAL, REGIONAL, NATIONAL OR INTERNATIONAL LEVEL
	We have formal long-term agreement of cooperation with the following institutions and Industry: CNR It is of major importance the long-lasting cooperation of the DG with the Italian State Agency for Research (CNR) through an agreement with the <i>Istituto di Geoscienze e Georisorse</i> (IGG, Pisa). The DG hosts 7 researchers and 1 technician of the CNR, while 8 Faculty staff of the DG are associated with the IGG. In addition, the DG hosts research laboratories and facilities supplied by CNR as detailed in Field 8. EU In the context of the Sixth Framework Programme (EU FP6), the DG is participating to the “Eurispet - European Intensive Seminars of Petrology” (www.eurispet.eu), a <i>Marie Curie</i> series of events for the training of early stage researchers in Petrology (2007-2010). The project is coordinated by B. Cesare and includes a network of six partners: UP, Eötvös University, Budapest (C. Szabo); Australian National University, Canberra (D. Rubatto); University of Granada (M.T. Gomez-Pugnaire); Institut de Physique du Paris (G. Godard); Eidgenössische Technische Hochschule, Zürich (P. Ulmer). Eurispet will organize six events in Paris (done in 2007), Canberra (2008), Budapest (2008), Granada (2009), Padova (2010), Zurich (2010) It consists of six Schools, where young European researchers in metamorphic petrology convene to learn the state-of-the-art in relevant disciplines of their research.. MAPEI S.p.A. (Milano) The UP and MAPEI S.p.A. (http://www.mapei.com/), a leading international producer of materials for the building industry, last year signed an agreement for the funding of research in the field of cement materials. Mapei agreed to fund research activities for ten years, with the aim of establishing a specialized Research Center. The goal is to create a bridge between University and Industry, so to have a quick transfer of know-how from advanced base research into the applied field, with a special consideration to the complex processes taking place in modern cement mixtures. G. Artioli is the scientific coordinator of the project, which at present includes advanced experimental characterization of materials (computed micro-tomography, in situ kinetics by XRPD, AFM investigation of the absorption of organic polymers on mineral surfaces) and modeling (i.e. multiscale modeling of cement properties by the Virtual Cement and Concrete Testing Laboratory http://vcctl.cbt.nist.gov/), in the attempt to relate the microstructural and macroscopic properties of cements and binders. Istituto Nazionale di Geofisica e Vulcanologia (INGV, Rome) Two members of the DG (G. Di Toro and G. Pennacchioni) have a formal association with the <i>Istituto Nazionale di Geofisica e Vulcanologia</i> (INGV) for the study of frictional processes during seismic faulting.
4	DEPARTMENT MISSION
	The Department is committed to excellence in research and to provide a high-quality learning experience for students at undergraduate and graduate levels, including preparation for those interested in professional, industrial, academic, governmental, and educational careers. Our motto is: think globally, while standing well rooted in your land. Specific areas of research, listed in detail below, range from topics aimed to the advancement of basic knowledge to

	topics aimed to cope with the emerging problems of the Society. In particular, we are engaged in studying processes at different scales, from the single crystal to the mountain ranges, and we strive for contributing to the mitigation of natural hazards and preservation of cultural heritage. We feel committed in interacting with our territory and industry and in promoting science outreach: we co work with regional and national agencies, particularly by producing geologic maps, recently (2007) we have signed a ten years agreement with a major Italian Corporate of the cement industry, and – after ten years of hard work - we are reopening to the public both the Museums hosted in our Department.
5	LIST OF RESEARCH PROGRAMMES 2003-2007 The scientific research carried out at DG is divided into four main research “programmes”, which have been named as: 1) Deep Earth; 2) Sediment Systems, Past Life and Deep Time; 3) Mineralogy, Petrography and Geophysics applied to Cultural Heritage; 4) Geological and Hydrogeological Hazards. Each programme is the merging of the “research projects” carried out by different research groups working in related fields. In turn, research projects are sometimes subdivided into “research lines”. A thorough description of each programme is reported in self-evaluation forms; a very brief programme description is reported below. <u>Programme 1: Deep Earth</u> (coordinators: G. Pennacchioni, F. Nestola) Knowledge of fundamental geodynamic processes of the Earth's interior can only be achieved through an integrated, multi-disciplinary approach. In this project the combination of Mineralogy, Petrology, Geochemistry, Structural Geology and Geophysics, has the aim to analyze crucial geological phenomena from the atomic to the global scale. <u>Programme 2: Sediment systems, past life and deep time</u> (coordinators: C. Stefani, F. Massari, D. Rio) Sediments and fossils are used for multiple aims, that span from the understanding of regional geologic evolution, to improvements and refinements of the Geologic Time Scale, and to the understanding of connections between the evolutions of environment (climate in particular) and Life. <u>Programme 3: Mineralogy, petrography and geophysics applied to cultural heritage</u> (coordinator: G. Molin) Research on Cultural Heritage aims to identification of raw materials and their provenance, determination of production technologies, also with the help of experimental simulations, analysis of alteration processes with the dual purpose of slowing down deterioration and planning rational conservation, and identification of buried structures and possible anomalous bodies or cracks in a single artefact. <u>Programme 4: Geological and hydrogeological hazards</u> (Coordinator: R. Genevois) The program aims are the study and monitoring, also by geophysical techniques, of surface and subsurface geological and hydrogeological processes that may cause risks to the inhabitants of the Italian northern-eastern regions. In particular, the program develops procedures and methods for a reliable quantitative assessment of mass movements hazards, hydrogeological characteristic of aquifers evaluating the parameters needed for design of remedial works and decision making.

6 HUMAN RESOURCES 2003-2007

Details of the human resources available at the DG in the 2003-2007 period are reported in Attachment DG-2; a summary is reported in the Table below.

	2003		2004		2005		2006		2007 DG	MEAN
	DMP	DGPG	DMP	DGPG	DMP	DPGP	DMP	DGPG		
FACULTY STAFF (at the end of the year)										
Full Professors	7	8	6	8	4	7	4	6	10	12
Associate Professors	7	9	7	10	7	10	11	14	25	20
Assistant Professors	4	8	4	6	4	8	1	9	13	11.4
<i>Total Faculty staff</i>	43		41		40		45		48	43.40
PHD & POST-DOCS										
PhD students	2	6	4	13	6	16	8	15	20	18
Post-graduate students	10	13	9	10	7	14	8	10	25	21.2
<i>Total Graduate/Post-graduate</i>	31		36		43		41		45	47.40
C.N.R. Unit										
Researcher	3	3	3	3	3	3	4	3	7	6.4
Technical staff	2	0	2	0	2	0	1	0	1	1.6
ADMINISTRATIVE & TECHNICAL STAFF										
Administrative	9	12	9	13	8	13	8	12	18	20.4
Technical	5	8	6	8	5	8	5	9	14	13.6
Museum Curators (CAM)	1	2	1	2	1	2	1	2	3	3

7 FUNDS AND RESEARCH GRANTS 2003-2007

The details of the funds and research grants of the DG in the 2003-2007 period are reported in the Attachment DG-3. A summary is reported in the Table below.

		2003		2004		2005		2006		2007	
		DMP	DGPG	DMP	DGPG	DMP	DGPG	DMP	DGPG	DG	MEAN
	SOURCE										
ORDINARY FUNCTIONING	Budget for Ordinary Functioning, including extraordinary allotment, from the University of Padua	44,86	67,49	44,85	62,96	46,24	63,16	54,12	66,14	119,83	113,93
EDUCATION	Budget for undergraduate student education from the University of Padova	26,56	45,53	28,92	71,54	43,82	47,38	38,18	45,07	88,44	87,09
	Funding for undergraduate student education from the EU	0,00	0,00	43,07	0,00	65,70	0,00	55,09	0,00	50,31	42,83
	Funding for graduate student formation from the University of Padova	8,13	0,00	8,17	0,00	6,04	0,00	19,36	0,00	23,57	13,05
	Funding for graduate student formation from the EU	0,00	0,00	0,00	0,00	0,00	0,00	451,99	0,00	0,00	90,40
RESEARCH	Research Grants from the University of Padua (ex-60%, Progetti di Ateneo, COFIN, funding for instrumental facilities)	171,80	108,70	125,20	208,16	114,07	158,47	165,59	148,69	244,93	289,12
	Research Grants from the Ministry for the University and Research (MIUR)	110,50	154,70	98,70	96,90	113,20	123,80	130,76	74,00	0,00	180,51
	Research Grants from National & International Agencies	0,00	159,99	9,25	5,00	0,00	37,00	97,00	130,00	451,50	177,95
	Revenues from Public & Private Institutions for research, advanced teaching and consultancy	4,50	63,64	4,47	304,25	12,65	65,84	17,93	392,70	507,35	274,67
	TOTAL (K€ per year) per Department	366,35	600,05	362,62	748,81	401,72	495,65	1.030,02	856,61	1.485,93	
	TOTAL (K€ per year)	966,40		1.111,43		897,37		1.886,62		1.485,93	1.269,55

8 SPACE AND EQUIPMENT AVAILABLE

Space

Presently, DG is mostly located in historical buildings within the city centre, occupying a gross area of 6.300 m², ca. 1.500 of which are Museums' spaces. Recently (2006) the DG was assigned an extra ca. 600 m² space in a nearby building ("*Sede staccata di Via Risorgimento*"). Plans of the main buildings and of the "*Sede staccata*" are reported in Attachment DG-4.

Equipment

The DG has extensive, open access-facilities to address problems in several field of geosciences and at the same time to provide an external service to other Italian Universities and private companies. In addition to the facilities of DG further instrumentations are provide by CNR. A detailed description of the DG laboratories and equipments is reported in Attachment DG-5 and summarized below.

- Thin section Laboratory
- Paleontological and sedimentological processing Laboratory
- Geophysics and electronic Laboratory
- Graphic and Image processing Laboratory
- X-ray powder diffraction Laboratory
- Single-crystal X-ray diffraction Laboratory
- XRF Spectrometry Laboratory
- Mineral deposits and mine prospecting Laboratory
- Scanning electron microscopy Laboratory

CNR laboratories located at DG:

- Geochronology Laboratory
- Rocks Grinding Laboratory
- Chemical Analyses Laboratory
- Electron Microprobe Analyses Laboratory

In the period 2003-2007, we made the following equipment acquisitions:

- upgrade of a UIC Coulometer for organic and inorganic carbon automatic measurements (investment of € 50,833.00 by DGPG);
- purchase of a Laser Scanner equipment (investment of € 118,188.00, co-funded by the Central University Administration and DGPG) ;
- Purchase of a Time-domain electromagnetic data acquisition system (investment of € 55,135.12; co-funded by the Central University Administration and DGPG) University;
- Micro-Raman system for determination of pressure within the diamond anvil cell (investment € 9,316.00, PRIN project);
- 3 Diamond anvil cells (Miletich type, Heidelberg) for in situ high-pressure diffraction experiments (in total 24,418.00 €, PRIN project).

9	PERMANENT AND OCCASIONAL LINKS ESTABLISHED WITH OTHER INSTITUTIONS AT LOCAL NATIONAL OR INTERNATIONAL LEVEL
	Faculty staff members of the DG actively collaborate with numerous researchers of different national and international institutions. Beyond formal collaborations outlined in Field 3, the following links are to be mentioned: 9.A) LINKS AT NATIONAL LEVEL The link between the DG and other Italian Universities and research institutions, although strong in the past, has been fostered since 1997 with the establishment of the “<i>Progetti di Ricerca di Interesse Nazionale</i>” (PRIN), funded by MIUR. The PRIN competition is based on an internationally peer-reviewed procedure, a brand new system in the Italian University for funding basic research. Applications for PRIN grants must be submitted by groups of researchers belonging to different Universities (with one University acting as national coordinator) and each University must contribute 30% of the project costs (labelled “COFIN”). PRIN grants have been the main source of funding of the basic research in the Italian Universities in the last years. The DG has performed very well in the PRIN competition (see field 15), acting in several cases as national leader institution. Virtually, we are cooperating with all major Italian Universities, as reported in Attachment DG-6. 9.B) LINKS AT INTERNATIONAL LEVEL As for the national collaboration, research links and active collaboration with numerous foreign Universities and research institutions can be inferred by co-authoring of scientific publications (see programme self-evaluation forms). We just mention here links with foreign institutions fostered by participation of Faculty staff of the DG to major international research and education projects: ICDP (<i>International Continental Drilling Program</i>) Within this major international project (http://www.icdp-online.org), members of the DG (G. Di Toro as a principal investigator) are participating to the project “<i>San Andreas Fault Observatory at Depth</i>” (SAFOD) that is also part of the initiative EarthScope (www.earthscope.org). This project has allowed the establishment of links with the following institutions: • Geological Department, Stanford University, CA, USA; • Laboratoire de Géophysique Interne et Tectonophysique, University of Grenoble, France; • Department of Geography and Geosciences, University of Louisville, KY, USA; • Physics of Geological Processes, University of Oslo, Norway. IODP (<i>Integrated Ocean Drilling Program</i>) IODP, formerly <i>Ocean Drilling Program</i> (ODP) and <i>Deep Sea Drilling Project</i> (DSDP), is probably the most successful and long-lived (since 1968) international research program in Geosciences. Palaeontologists and structural geologists of the DG have been active participants. This involvement has favoured links with many institutions worldwide, among which a tight cooperation is presently ongoing with the following: • Instituto de Ciencias del Mar, Barcelona, Spain; • Department of Geology and Geochemistry, Stockholm, Sweden; • National Oceanography Centre, University of Southampton, UK; • Department of Earth Sciences, University of Cambridge, UK; • Department of Geological Sciences, University of South Carolina, USA;

	• Institute of Environmental Biology, Utrecht University, NL; • Woods Hole Oceanographic Institution, Woods Hole, MA, USA; • Department of Geological Sciences, University of Florida, Gainesville, USA; • Lamont -Doherty Earth Observatory, Columbia University, New York, USA; • Center for Marine Environmental Sciences (MARUM), Bremen University, Germany.
10	RESEARCH AND CONSULTANCY SERVICES CARRIED OUT ON BEHALF OF THIRD PARTIES
	In 2003-2007, the DG signed contracts with the following public Institutions: • Regione del Veneto (Veneto Region, Department of Land Management and Department of Water Resources and Quarry and Mine Activity); • A.A.T.O. (<i>Autorità d'Ambito Territoriale Ottimale</i>), Water Authority for the Venice Lagoon; • Parco Regionale Colli Euganei (Authority for the Euganean Hills Natural Park); • Provinces of Vicenza and Trento, • Municipalities of Lonato, Selvazzano, Fregona, Asiago, S. Michele al Tagliamento, Montecchio. Private Firms that have sponsored applied Departmental research in 2003-2007 include: • MAPEI S.p.A. (Milan) • Division Exploration & Production of ENI S.p.A (Milan); • Veneta Mineraria (Este, Padova: http://www.venetamineraria.com/). See field 8 for aggregate revenues from these contracts.
11	OTHER RELEVANT ACTIVITIES
	Department Faculty staff have been active in organising seminars, conferences and workshops at local, national and international levels. These activities are detailed in single Program Self evaluations and, in part, in Field 15. In the following, we summarise the most relevant activities distinguishing those strictly related to research, pursued at international level, from activity related to advanced education, at both national and international level, and activity aimed to the Geoscience outreach, at local or national levels. THE 32nd INTERNATIONAL GEOLOGIC CONGRESS OF FLORENCE (2004) Undoubtedly, the main organisational commitment carried out by members of the DG in the 2003-2007 period has been related to the 32nd International Geologic Congress, which was held in Florence, August 2004. This has been a major effort (and success) of the Italian Geoscience community, and we are proud to have contributed at several levels of both the planning and the making of this major event. A member of the DG (F.P. Sassi) was a member of the Organizing Committee, and another (D. Rio) of the Scientific Program Committee; B. Cesare and D. Rio were Symposia conveners; B. Cesare, R. Genevois and R. Spiess have been Session conveners; B. Cesare, G.V. Dal Piaz, N. Preto, C. Stefani have organized field trips. OTHER INTERNATIONAL MEETINGS Members of the Faculty staff of the DG have organized thematic sessions at several international meetings, including:

- AGU (American Geophysical Union) Fall Meeting, San Francisco (2003), Session V05 (R. Spiess); 2004, Session T20 (G. Di Toro with T. Shimamoto, D. Goldsby & J. Rice); 2007, Session H41H (G. Cassiani with K. Holliger) and H44A (G. Cassiani with A. Bellin);
- EGU (European Geological Union) General Assembly, Vienna (2005), Session G8/GD10 (A. Caporali, Fischer, K. Heidbach, O); 2006, Session TS4.1 (G. Di Toro with T. Shimamoto & M. Cocco); 2006, Session TS1.4 (G. Pennacchioni with N.S. Mancktelow & Y. Rolland); 2007, Session SM22/TS3.1 (G. Di Toro with J. Schmittbuhl & K. Mair);
- DRT (Deformation Mechanisms, Rheology and Tectonics) Conference, Milano (2007) (G. Pennacchioni with U. Bayer and T. Engelder);
- SMEC (Study of Matter at Extreme Conditions) Conference, Miami (2007), Session 11 (G. Artioli and F. Nestola);
- International Workshop on “Surface reactivity in minerals”. Gargnano (2006) (G. Artioli);
- International Workshop on “Early Cenozoic Extreme Climates”, Padova and Belluno (2005) (D. Rio);
- 2005, International Meeting “Micas @ Italy, Rimini (R. Sassi);
- 2006, 23rd European Crystallographic Meeting, Leuven (Belgium) (G. Artioli);
- 2006, 10th European Powder Diffraction Conference, Geneva (Switzerland) (G. Artioli);
- 2007, 5th International Debris-Flow Hazard Mitigation Conference, appointed as a Chief Organizer (R. Genevois).

ADVANCED EDUCATION

We have already commented the important Eurispes initiative (see Field 3). Other relevant educational activities were:

- 2006, Meeting of Young Researchers in Earth Sciences (MYRES) II – Dynamics of the Lithosphere (<http://myres.org/meetings.html>) - Verbania (Italy), (L. Montesi and G. Di Toro);
- 2006, Scuola Piali (<http://users.unimi.it/rockdef/scpialli/old/neves/index.htm>) (G. Pennacchioni, and N.S. Mancktelow);
- 2006, National School AIC (Crystallographic Italian Association) – Diffraction on polycrystalline materials”. Martina Franca (Italy) (G. Artioli);
- 2006, Short Training Course on "Groundwater Management in the Framework of Integrated Water Resources Management IWRM" organized by UNESCO, Cairo (Egypt) (G. Cassiani);
- 2006, International School of Applied Geophysics, Erice (Italy) (G. Cassiani);
- 2006, FIVA PhD course on Hydrogeophysics, Copenhagen (Denmark) (G. Cassiani);
- 2007-2008, International School in Mineralogy – HP-HT Mineral Physics: Implications for Geosciences. Brixen – Bressanone (F. Nestola and L. Secco).

GEOSCIENCE OUTREACH

Once a year, during the national “Week of the Scientific Culture”, promoted by the MIUR, the DG (in collaboration with the “*Centro di Ateneo per i Musei*”, CAM) has organised series of conferences and guided visits to the Museum of Geology and Paleontology and the Museum of Mineralogy. Talks and guided visits are addressed to High School students and teachers. We cooperate with Science outreach initiatives organized by the Municipality of Padova and other local Authorities (e.g. “[Vivipadova](#)” and “[Sperimentando](#)”). In order to facilitate graduate students in entering the labour market, P. Fabbri is organizing once a year Workshops on Hydrogeology (see programme 4) in cooperation with enterprises active in the field.

12	PARTICIPATION IN Ph.D. PROGRAMMES																																																																						
	Since 1984, the Department hosts a graduate student program (“<i>Scuola di Dottorato</i>”) in Earth Sciences, which produced several Faculty members in Italian and foreign Universities. The basic statistics for the past five years of our “<i>Scuola di dottorato</i>” is reported in Field 6. It should be noted that our PhD program was granted 5 doctoral scholarships per year by the UP, and 9 3-year contracts were funded by private and/or public Institutions (e.g. Cariparo Foundation, PRIN, Authority of the Euganean Hills Natural Park, Angelini Foundation of Belluno). Members of the DG participate to two other Ph.D. programs of the University of Padova: the “<i>Scuola di Dottorato</i>” in Cultural Heritage and the “<i>Scuola di Dottorato</i>” in Space Sciences and Technologies.																																																																						
13	RESEARCH OUTPUT																																																																						
	Research output of the DG in the period 2003-2007 are thoroughly reported in each programme self-evaluation. Selected papers are reported in the attached “List of Research output” (the list does not include the abstracts at conferences). In the following tables, we synthesize some relevant statistics, concerning the entire DG and single programmes. Note: products have been classified (first column) according to a slightly modified CINECA codification, which is as follows: A1: Articles in referred ISI international journals (ISI Web of Knowledge); A2: Articles in non ISI journals; B1: Articles in international books; B2: Articles in national books; D: Proceedings; E: Volume editing; F: Abstracts at conferences; GM: Geological maps. Scientific products of DG <table><tr><th>Year</th><th>2003</th><th>2004</th><th>2005</th><th>2006</th><th>2007</th><th>Total</th></tr><tr><td>A1</td><td>31</td><td>23</td><td>41</td><td>44</td><td>59</td><td>198</td></tr><tr><td>A2</td><td>11</td><td>11</td><td>17</td><td>13</td><td>15</td><td>67</td></tr><tr><td>B1</td><td>6</td><td>4</td><td>2</td><td>10</td><td>6</td><td>28</td></tr><tr><td>B2</td><td>10</td><td>6</td><td>3</td><td>12</td><td>0</td><td>31</td></tr><tr><td>D</td><td>13</td><td>6</td><td>15</td><td>28</td><td>21</td><td>83</td></tr><tr><td>E</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>3</td></tr><tr><td>F</td><td>72</td><td>80</td><td>74</td><td>79</td><td>101</td><td>406</td></tr><tr><td>GM</td><td>3</td><td>5</td><td>1</td><td>1</td><td>12</td><td>22</td></tr><tr><td>Total</td><td>148</td><td>136</td><td>152</td><td>188</td><td>214</td><td>838</td></tr></table>	Year	2003	2004	2005	2006	2007	Total	A1	31	23	41	44	59	198	A2	11	11	17	13	15	67	B1	6	4	2	10	6	28	B2	10	6	3	12	0	31	D	13	6	15	28	21	83	E	1	1	0	1	0	3	F	72	80	74	79	101	406	GM	3	5	1	1	12	22	Total	148	136	152	188	214	838
Year	2003	2004	2005	2006	2007	Total																																																																	
A1	31	23	41	44	59	198																																																																	
A2	11	11	17	13	15	67																																																																	
B1	6	4	2	10	6	28																																																																	
B2	10	6	3	12	0	31																																																																	
D	13	6	15	28	21	83																																																																	
E	1	1	0	1	0	3																																																																	
F	72	80	74	79	101	406																																																																	
GM	3	5	1	1	12	22																																																																	
Total	148	136	152	188	214	838																																																																	

Scientific products for single Programme

Programme 1

Year	2003	2004	2005	2006	2007	Total
A1	20	10	18	25	32	105
A2	7	8	5	5	2	27
B1	4	1	0	3	5	13
B2	5	1	1	0	0	7
D	1	2	2	4	3	12
E	1	1	0	1	0	3
F	44	38	54	58	56	250
GM	3	5	1	0	8	17
Total	85	66	81	97	106	436

Programme 2

Year	2003	2004	2005	2006	2007	Total
A1	8	6	12	11	17	54
A2	2	2	10	2	7	23
B1	2	3	2	4	1	12
B2	5	3	2	6	0	16
D	0	0	0	0	0	0
E	0	0	0	0	0	0
F	21	24	16	16	34	111
GM	0	0	0	1	4	5
Total	38	38	42	40	63	221

Programme 3

Year	2003	2004	2005	2006	2007	Total
A1	1	5	5	3	4	18
A2	0	0	1	2	2	5
B1	0	0	0	0	0	0
B2	0	1	0	3	0	4
D	9	2	5	17	9	42
E	0	0	0	0	0	0
F	0	0	0	0	0	0
GM	0	0	0	0	0	0
Total	10	8	11	25	15	69

Program 4

Year	2003	2004	2005	2006	2007	Total
A1	2	3	5	5	7	22
A2	2	1	1	4	4	12
B1	0	0	0	3	0	3
B2	0	1	0	3	0	4
D	3	2	8	7	9	29
E	0	0	0	0	0	0
F	7	18	4	5	11	45
GM	0	0	0	0	0	0
Total	14	25	18	27	31	115

14 SWOT Analysis

In this section we present an attempt (most probably candid) of assessment of the Strengths, Weakness, Opportunities and Threads (SWOT analysis) of the whole Department, rather than of the single programs. Such an assessment is indeed difficult without criteria to adopt as reference, provided that they do exist. In addition, any SWOT analysis of an individual structure, such as a Department, must be viewed in the context of the (peculiar) Italian

University system and of the entire Athenaeum. Ideally, such an assessment should be as quantitative and objective as possible, with reference to indicators apt to evaluate the academic quality of a Department. Being such reference framework missing, it has been felt useful to perform our SWOT analysis exercise with respect to what we have stated to be our mission: *advancement of knowledge, formation strictly connected to research, and interaction with the territory in terms of Science outreach and contribution to economic and social progress*. Therefore, we have asked ourselves: are we well equipped in terms of facilities and human resources? Which is the impact of our research activity in the international community? How do we interact with the territory and, more in general, with Society?

1. STRENGTHS

1) The foremost output of any Department is represented by scientific publications in international peer-reviewed Journals. In evaluating scientific performances, it is a common practice to consider the journals listed by the Institute for Scientific Information (ISI), that are amenable to bibliometric measurements. This practice is not entirely satisfactory for Geosciences, because papers of strong impact are often published in special volumes of major scientific societies (e.g. AAPG, SEPM, AGU, etc.) that are not considered by ISI. In addition, ISI ignores geologic maps, that in some instances are absolute milestones in geologic research. However, with reference to the ISI database (see Field 13), nearly 200 papers have been published by members of the DG in the considered period. This figure is astonishing, if compared with the publishing habit of our community in the '90. In a previous evaluation of the Faculty of Sciences for the period 1996-1998, the two former Departments summed a total of 63 papers in the ISI circuit. In the last three years, we have published 144 papers in the ISI circuit (see Field 13). In 2003-2007, Faculty staff of the DG have co-authored 8 papers in *Nature* (I.F. 29) and 2 papers in *Science* (I.F. 26). Another relevant indicator for assessing the performance in research is the number of citations (see Attachment DG-7). This parameter obviously becomes more reliable after several years of publication, yet we believe that the overall >950 citations obtained for papers published between 2003 and 2007 (as at July 2, 2007) reflect a strong impact of the work of our Department. The maximum *h-index* of members of the Department is 21, the minimum is 0. The maximum number of citations to a Faculty member of DG is 1377. Other nine researchers scored more than 300 citations. Regrettably, two DG members have zero citations. So far, the most quoted papers produced in 2003-2007 in the DG (*Nature*, 2006, vol. 441, pp. 601-605 and *Nature*, 2004, vol. 427, pp. 436-439) scored 53 and 50 citations, respectively: this constitutes a strong return in our fields. Therefore, it is felt that - considering the ISI metrics - publishing at international level is a point of strength of the DG, even if this performance is not evenly distributed among different research groups (see "Weaknesses" below).

2) Points of strength of the DG are: a) a first-class instrumental equipment and laboratory facilities, including those of the CNR (see Field 8): the foresighted politics of the UP in co-funding our equipment must be acknowledged; b) the Library (with 358 journal subscriptions, ca. 20,000 volumes - including historical texts dating back to the XVII century - and ca. 14,000 geologic maps), probably the largest Geoscience University library in Italy; c) the Museum of Geology and Paleontology and the Museum of Mineralogy, which contain rich collections sometimes dating back to Renaissance times.

3) Other points of strength are: a) links at national and international levels (see Fields 3 and 9), crucial for research and graduate student education, and b) relationships with territory and industry (see Fields 3 and 10), which are of the essence for Geoscience outreach and money raising. In the fiscal year 2007, ca. 40 % of our research funding was generated from industry or local government agencies (see Field 7).

4) Last, but not least, a point of strength of the DG are the politics we are following in the

ongoing renewal of the Faculty staff (see Field 16). In the last years, we have hired a Full Professor and two Associate Professors from other Italian Universities, which is (regrettably) unusual in the Italian University system. We have also hired and we are hiring a large number of young Assistant Professors, thus reversing the trend prevailing in the past (see Field 16). It is felt that the new generation of scientists at the DG have a strong potential for increasing our academic quality.

2. WEAKNESSES

There are several points of weakness at the DG, some of which are independent from the management of the Department.

1) A first, long-lasting weakness has been the lack of space, in particular for research laboratories; the previous DGPG, located in large part in an historical Renaissance building ("*Palazzo Cavalli*"), was indeed poorly suitable for teaching and research. This problem has been partially solved in 2006 with both the assignment to the DG of a ca. 600 m² space in a nearby building and the merging of the two former Departments (with the sharing of some labs and the unification of administrative and library services). However, the problem persists, even if it is close to a solution because a new building entirely dedicated to the DG is being built in the town University area that should be available at the end of 2009. The new building is a great opportunity for our community, as detailed below.

2) Another weakness is represented by the little Geoscience teaching at the UP outside the Faculty of Sciences. This is regrettable not only from a formative-cultural point of view, but also for its consequences in terms of human resources for research. In fact, in the Italian University system the budget for recruitment is allocated in Faculties and not in Departments, as is the case for most of our foreign competitors. We have pushed strongly in the last years for changing the situation and apparently we are getting some success, as mentioned in Field 16.

3) Possibly, a negative feature of the DG is the excessive spread of disciplines and the number of research lines that are pursued at DG. This feature derives firstly from the fact that in the Italian University system, a wide disciplinary coverage is needed for delivering specific degrees (such as Geological Sciences) and getting a good evaluation of the formative offer at the undergraduate levels.

4) Good research performances are surely hampered by the excess of organisational duties requested in the Italian University system; Faculty staff in charge of such duties are left little or no time for teaching and research. This situation has been exacerbated by the need of coping with the continuously changing rules at national (two reforms of the Undergraduate formation in 7-8 years!) and local levels (among other things, the UP has changed the Statute in 2007).

5) For a series of unfavourable circumstances (i.e. unpredicted early retirements, stopping of the recruitment of Faculty staff), in the last years young Assistant Professors of the DG have been overloaded with teaching duties.

6) Partnership with other Departments of the UP, either in terms of research and lab facilities sharing, is limited, even if new initiatives are under way (see Field 16).

7) Certainly, another weakness (independent from the management of the Department) is represented by the low salaries. This is true at all academic ranks, and becomes dramatic at the graduate student level, where the current salary of ca. 1,000 € per month virtually writes us off the circuit of top international students. This state of affairs is surely hampering the recruitment of good international students, who cannot afford to move to the University of their choice based on their plans for career development alone. Most students end up staying in the same Institution where they pursued their undergraduate studies.

8) Last, but not least, the division in two different Departments until 2006 has hampered the development of strong scientific ties and collaboration even between overlapping and neighbouring scientific disciplines. Also because of historical reasons, there has been the

tendency by the different teams to pursue specific interests of single groups rather than that of the DG. In spite of initial opposition to unification (see pag. 168-169 in Attachment DG.1), we feel that this habit is changing.

3. OPPORTUNITIES

Ahead of us, we have three great opportunities we must comply with:

- 1) merging of ca. the 90% of Geoscientists active in the UP in a unique Department;
- 2) the new building of the DG, mentioned above;
- 3) the great generational turnover (under way) in the Faculty staff.

A unique Department

A unique Department offers the possibility to a large number of colleagues to interact on related research fields, a fact that is already nurturing joint projects and publications among scientists of different sectors. For example, it must be mentioned the ca. 450 K€ grant to G. Pennacchioni (2007, Cariparo Foundation) for an Excellence Research Project, in which structural geologists work together with mineralogists and petrologists.

A unique Department also results in a large “critical mass” that facilitates the acquisition of equipment and tools that would be difficult to acquire individually.

Furthermore, a unique large structure allows better visibility of Geosciences in the territory and within the UP. Actually, it seems that Geosciences are growing in importance in other Faculties (see Field 16). In particular, we emphasize the cooperative atmosphere with the Department of Hydraulics both in research and in a joint effort for hiring Faculty staff (see Field 16).

The new building

Great expectations lie in the forthcoming grand inauguration of the new five-storied building of the DG expected in late 2009. The available spaces (ca. 12.600 m²) are quite sizable, and the potential for improving our research (ca. 4.000 m² for laboratories) and educational performances (ca. 1.800 m² for lecture rooms and student spaces, plus a library of ca. 900 m²) are enormous. The new Department does represent a unique opportunity that we are willing to exploit for building a true community of Faculty staff, graduate and undergraduate students.

The generational turnover

A large number of Faculty staff has retired in the last years or is going to retire in the next two years. We have been aware of this, and we have been coping with this generational turnover by adopting a plan for hiring Faculty staff (detailed in Field 16) aimed to an optimal development of the research and teaching potential.

4. THREATS

What we perceive as a major threat is the national political situation: the scarce considerations by our governors for education, formation and research are known worldwide and, being the Country in economic stagnation, we are frightened of further cuts in the allocation of resources in the University system. As a matter of fact, in the last years our international connections have been seriously hampered by the lack of co-funding by Italy to major international projects (e.g., the IODP). Another concern badly felt in our community is the decreasing number of enrolment in Science Faculties in general, and in Geosciences in particular.

Nevertheless, we are rather optimistic in our future: our community is growing, we believe to perform much better than in the past, and the UP and the Faculty of Sciences (to which most of us belong) have been ranked in the last years among the top Universities and Faculties of Sciences in Italy (see [CENSIS](#) data).

15 NATIONAL AND INTERNATIONAL REPUTATION-RANK.

National

Assessment of the national reputation-rank of the DG was facilitated by the recent decision of both MIUR and Central Administration of the UP to endeavour an evaluation of the quality of Academic research in Italy and in the University of Padova, respectively.

In 2004, MIUR has designated a national Committee (“*Comitato Italiano per la Valutazione della Ricerca*”, CIVR) which, by means of an international peer-reviewing system, has ranked the research performances of the various Italian Universities and scientific areas within. Each University was prompted to submit a fixed number of “products” (generally Journal papers) pre-determined by MIUR based on the number of Faculty members actually enrolled. The UP was ranked first in Italy. Equally, Geosciences (Disciplinary Area 04 – Earth Sciences; see Field 2) of Padova was ranked first in Italy. It should be noted that out of the 10 products representing the Area of Earth Science of Padova, 9 were Journal papers all authored by members of the DG (see Attachment DG-8), and one was a geologic map co-authored by members of the DG and of the Department of Geography. As well noteworthy is the fact that the overall assessment of the quality of the products was 0.960 out of 1.000, definitely the highest ranking within the various scientific areas of the UP (see table below, courtesy of Andrea Sciandra of the Research Office of the University of Padova). Therefore, we can safely conclude that the DG has brought a major contribution to the top evaluation of the University of Padua.

Area	National ranking	Evaluation (out of 1.000)
Earth Sciences	1 st	0.960
Physics	1 st	0.953
Civil Engineering and Architecture	1 st	0.941
Information Engineering	2 nd	0.853
Agronomy and Veterinary Sciences	2 nd	0.786
Biology	3 rd	0.924
Chemistry	4 th	0.890
Economics and Statistics	4 th	0.850
Historical, Philosophical, Pedagogic and Psychological Sciences	4 th	0.785
Political and Social Sciences	5 th	0.783
Mathematics and Computer Sciences	7 th	0.852
Philological-Literary and Historical-Artistic Sciences	9 th	0.914
Law Sciences	10 th	0.738
Medical Sciences	12 th	0.760

In order to evaluate with a consistent gauge the research performances of various (frequently distant) scientific areas, both MIUR and the UP chose to employ, as a leading criterion, the rate of success in PRIN applications (see Field 9). Consistency and trustworthiness of this comparative value stems directly from the philosophy of PRIN competition, which guarantees any Italian researcher to share the same opportunity of success independently of the Academic role and University. In the following table (a courtesy of Dr. Andrea Sciandra), we show that the rate of PRIN success for Earth Sciences is the highest within the entire Athenaeum of Padova. Taking into consideration that the rates of PRIN success of the UP are among the highest in Italy, and that the DG hosts the ca. 90% of all Earth scientists presently active in Padova, we feel confident in claiming that the DG has performed very well at national level also with reference to this indicator.

Year	Number of presented projects	Number of successful projects	Rate of success in the Area	Rate of success within UP
2003	13	6	46%	42%
2004	10	6	60%	44%
2005	9	7	78%	46%
2006*	9	4	44%	35%
2007	Data not yet available			
total	41	23	56%	42%

International

We assume as indicators of good international reputation of the DG the following items:

- Editorial activity;
- Invited talks in international meetings;
- Invited seminars and lectures;
- Service in international scientific organizations and committees;
- International Awards.

Editorial activity

a) Membership of Editorial boards of National and International Journals:

- Rendiconti della Accademia Nazionale dei Lincei (classe Sc. Fis. e Nat.) (F.P. Sassi);
- Bollettino della Società Geologica Italiana (F.P. Sassi);
- Periodico di Mineralogia, 2004-2007 (B. Cesare);
- Journal of Metamorphic Geology since 2007 (B. Cesare);
- Ofioliti (Dal Piaz G.V.);
- Eclogae Geologicae Helvetiae and later Swiss Journal of Geosciences (Associate Editor: Dal Piaz G.V.);
- Terra Nova (Associate Editor: Dal Piaz G.V.);
- Journal of Asian Earth Sciences (2003) (Associate Editor: A. Caporali);
- Near Surface Geophysics (Associate Editor: G. Cassiani);
- Stochastic Environmental Research and Risk Assessment (G. Cassiani).

b) Editing of Scientific Volumes:

- Editing of Volume: "The abundance of 55 elements and petrovolumetric models of the crust in 9 type areas from the cristalline basements of Italy, with some geophysical and petrophysical data". *Scritti e Documenti, Accademia Nazionale delle Scienze detta dei XL* (2003), vol. 32, 464 pp. (Sassi F.P.; co-editors: Cesare B., Mazzoli C., Spiess R., Sassi R.);
- Guest Associate Editor of *American Mineralogist* (2008), vol. 93, pp. 261-455 (Sassi F.P.);
- Guest Editor of Special Volume of *Periodico di Mineralogia* (2004), vol. 73, 271 pp. (B. Cesare);
- Co-editor of the special theme issue of *The European Journal of Mineralogy* on the workshop topic (2007), European Journal of Mineralogy, vol. 19 (Sassi F.P.).

Invited/solicited talks at international meetings

Invited/solicited talks at international level were more than 10 as listed in the Programme self-evaluation. These also include four seminars in the ISPET programme.

	<i>Invited international seminars and lectures</i> Invited seminars at international research institutions and universities were about thirty (see Programme self-evaluations). <i>Service in international scientific organizations and committees</i> • 2000-2004, <i>International Commission of Stratigraphy</i> (ICS) of the <i>International Union of Geological sciences</i> (IUGS) (Vice-chair: D. Rio) • 2000-2004, <i>Subcommission on Neogene Stratigraphy</i> (SNS) of the ICS (corresponding member: D. Rio) • 2003-2008, <i>Commission on Systematics in Petrology</i> (CSP) of the International Union of Geological Sciences (IUGS) (coordinator: F.P. Sassi) • 2003-2008, <i>Commission on Systematics in Petrology</i> (CSP) of the International Union of Geological Sciences (IUGS) (member: G. Bellieni) • 2004-present, Working Group on Lower-Middle Pleistocene boundary of the <i>Subcommission on Quaternary Stratigraphy</i> (SQS) of the ICS (voting member: L. Capraro) • 2005-2008, AGU Hydrogeophysics Technical Committee (member: G. Cassiani) • 2006-present, <i>Subcommission on Triassic Stratigraphy</i> (STS) of the ICS (voting member: P. Mietto) <i>Awards</i> • In 2007, G. Di Toro was awarded by the European Research Council a ca. 2.000.000 € Starting Grant Project (2008-2012); • In 2008, G. Di Toro was awarded of the <i>Outstanding Young Scientist Award of the European Geosciences Union</i> for his contribution, since he completed his Ph.D in 2003; • In 2007, R. Deiana was awarded of the EAGE Mintrop Award for the best paper in Near Surface Geophysics (Deiana et al. 2007, <i>Near Surface Geophysics</i> 5, 3, 183-194); • In 2001, D. Rio has been awarded a <i>Laurea honoris causa</i> in Earth Science by the University of Stockholm. In addition, F.P. Sassi, B. Zanettin and G.V. Dal Piaz are members of the <i>Accademia Nazionale dei Lincei</i> and of the <i>Istituto Veneto di Scienze, Lettere ed Arti</i>; F.P. Sassi, B. Zanettin, D. Rio and G. Bellieni are members of the <i>Accademia Galileiana di Scienze, Lettere ed Arti</i>; P. Mietto is member of the <i>Accademia Olimpica</i> of Vicenza. Based on the analysis described above, we feel confident that the DG stands out in the National settings of its disciplines. We are unable to make any definitive assessment of our international reputation. However, a comparison with other top Institutions based on parameters such as the mean citations per Faculty member per year (5 for the DG), and the mean impact factor of the journals where we are publishing (3.2), suggests a good performance.
16	STRATEGIC PLANS FOR THE FUTURE
	We take advantage of this self-evaluation for reiterating some strategic choices made in the past and for better defining a plan for the near future (3 years). Our plan is strongly dependent on deliberations already taken by the Central Administration of the UP and is based on the current regulations, especially in the recruiting system (we recall here that in the Italian University system the budget for research staff recruitment is assigned to the Faculties, and not directly to the Departments). However, with the ongoing and forecasted

Faculty staff hiring, the moving to new building (end 2009) and the re-opening of the two Museums (beginning 2009), the DG is poised to make significant strides in education and in research.

ENHANCE EDUCATION

Undergraduate education

In 2007-2008, we have revised our undergraduate curricula by identifying key skills, reducing overlap between courses, and by opening (academic year 2008-2009) a new curriculum in Subsurface and Petroleum Geology in synergy with ENI , the leading Italian oil company. In the next years we should carefully monitor results and adjust the curricula to the needs of our undergraduate students.

Extended field-based activity and field trips have being basic requirements for all undergraduate courses, because they allow students to observe first hand the physical underpinning of geologic theory and principles. This activity is very expensive, and there is a need of external financial support. We were able in the past to find support from local authorities (e.g. Municipality of Feltre, Angelini Foundation of Belluno). In the future, we should pursue similar endowment for maintaining the present high standard in this vital activity.

Graduate education

Graduate students are the fuel propelling our research programs through their energy, enthusiasm, and hard work. Our graduate programs, although positively evaluated by the (MIUR), presently need actions aimed to (1) improve present working conditions, (2) enhance mobility and exchanges, especially towards external laboratories, and (3) a more efficient coordination of the educational activities.

Item 1 will be partially loosened by the planned moving into the new building. The number of students per office will be restricted to a maximum of four, so that more space and comfortable environments will be available.

Item 2 is at present heavily inhibited by unsatisfactory economic conditions. Not only travelling of our graduate students abroad for research and meetings is seriously underfunded, but also grants and salaries available for foreign students are rather unattractive (see Field 14). This restrains students from industrial countries to apply for our graduate programs and favours inbreeding conditions. The Department is trying to move out of this stagnating conditions by creating strong research collaborations and worldwide networks of scientific and teaching activity, such as the Eurispet (see Field 3) and the *High Pressure Crystallography Interest Group* recently (July 2008) organized by Dr. Fabrizio Nestola to foster international educational activities in the field of mineralogical crystallography. Universities involved are: UP, Virginia Tech, Bilbao University, University of Innsbruck, University of Heidelberg, University of Copenhagen, University of Edinburgh.

Item 3: advanced courses at the graduate level were virtually inexistent until very recently, apart from a few advanced workshops. We are completely revising the teaching curricula and the arranging of advanced courses, often organized in collaboration among several Doctorate Schools of the UP. This year, for the first time, we are offering a number of courses, including a few activities aimed to complement undergraduate curricula. Advanced specialized courses and seminars are also being organized by visiting and invited scientists of international reputation. Special support for inviting scientists in the field of Materials Science is provided through a special chapter of the ten-year research agreement between the UP and MAPEI S.p.A (see Field 3).

Science outreach

We will enhance our educational mission by taking advantage of the outreach opportunities provided by the reopening of the Museum of Geology and Paleontology and the Museum of

Mineralogy, forecasted for the beginning 2009. In particular, in synergy with local authorities, we are planning guided visits for high school students and temporary exhibitions. Other initiatives are possible, among which - in the occasion of the opening of the Museum - there will be a series of conferences open to the lay public for celebrating the International Year of the Planet Earth (2007/2009).

ENHANCE RESEARCH

The DG has been widely recognized in the past as a leader in a number of traditional Geoscience research areas (e.g. Alpine Geology, Micropaleontology, Mineralogy, Petrology etc.). However, with the hiring of new Faculty staff, we are pursuing innovative programs at the interface of disciplines (Material sciences and Engineering). So far, these have reaped two major rewards in funding: the ten-year 3.5 M€ contract signed with MAPEI S.p.A (see Field 3) and a grant to G. Cassiani (2008) awarded by CARIPARO Foundation for “Excellence Project”.

In order to pursue excellence in our traditional field and in the new research initiatives, we feel engaged in:

- continuously upgrading our laboratory facilities;
- enhancing partnerships with other Departments of the UP.

Improving laboratory facilities

There is an uneven distribution of equipments and laboratory facilities among the various research groups of the DG. Therefore, we are planning investments in the fields of Applied Geophysics and Applied Geology. In particular, acquisition of a Ground Penetrating Radar (GPR) for borehole applications (investment of about 60,000 €) is forecasted for 2008. We will promote a partnership with the Department of Hydraulic Engineering (as encouraged by the UP Central Administration) aimed to develop a laboratory for soil and rock physical properties in order to cope with the need of the Applied Geology Group of the DG. In the perspective of improving the existing lab facilities of the DG (see field 8), we are upgrading a Philips X’Pert powder diffractometer and acquiring a new one (investment of ca. € 240,000).

Enhance partnerships with other Departments in the UP

Partnerships of the DG with other Departments in UP are limited (see Field 14), even if a reversing trend is under way (for example, recruitment of Faculty staff: see below). We definitively want to increase such partnerships in the next years, not only for acquiring new equipments and sharing lab facilities, but also for enhancing the research potential. Specifically, we have already undertaken two initiatives: the establishment of a Research Center for *Cultural Heritage* with 1) Department of Archaeology, 2) Department of History of Art and Music, 3) Department of Chemical Sciences, 4) Department of Structural and Transportations Engineering and 5) Department of Architecture, Urban Planning and Surveying, and a Research Center for *Cements and Building Materials* with the Department of Civil Engineering.

HUMAN RESOURCES

To succeed in obtaining our goals, we strongly depend on the availability of future resources for hiring and/or promoting Faculty, administrative and technical staff.

Administrative and technical staff

The number of administrative and technical staff of the DG (field 6), albeit reduced after the unification into the new DG, can be considered satisfactory.

Faculty staff

In anticipation of the large number of retirements to be expected in the next few years, in 2005 the entire community of Earth Sciences of the UP has made a new plan for the future composition of the Faculty staff taking into account the diminished availability of resources and the new strategies for the Earth Sciences at the UP. The new plan was labelled “ *Modello Tenzionale dell’Area di Scienze della Terra in Ateneo*”, MTAA post-2010 and is reported below.

SSD	GEO/01	GEO/02	GEO/03	GEO/04	GEO/05	GEO/06	GEO/07	GEO/08	GEO/09	GEO/10	GEO/11	ICAR	Total
1994 budget in the Faculty of Sciences (PB)	23	29	13	15	9	18	21	6	9	5	14	3	165
1994 budget in other Faculties (PB)							12						12
MTAA post-2010	PB	18	22	14	16	16	20	6	12	4	11	0	155
	PO	1	2	1	1	1	1	1	1	1	1	0	12
	PA	2	2	2	2	2	4	0	2	0	1	0	19
	RU	4	4	2	3	3	3	2	1	1	0	2	25

Note: PB is a conventional measure of the salary costs, being 2 PB the cost for an Assistant Professor (=RU), 3 PB for an Associate Professor (=PA) and 4 PB for a Full Professor (=PO).

The MTAA was conceived as a guide for allocating the budget that the Departments receive from the Faculties. It was deliberately conservative because of the expected reduction of funds for salaries in the Italian University System. The amount of resources allocated in the various SSDs was determined considering teaching duties, performance in research, and national standards. The MTAA has been very useful in minimizing conflicts among the different research groups and in planning the various recruitment actions. Thanks to a fruitful cooperation with the Faculties of Engineering and Agronomy, the following operations are under way (and to be accomplished within mid-2009):

- 1) Hiring of one RU in SSD GEO/01 (Faculty of Sciences)
- 2) Hiring of two RUs in SSD GEO/02 (Faculty of Sciences)
- 3) Hiring of one RU in SSD GEO/09 (Faculty of Sciences)
- 4) Promoting a PA to a PO position in SSD GEO/02 (Faculty of Sciences)
- 5) Promoting a PA to a PO position in SSD GEO/07 (Faculty of Sciences)
- 6) Promoting a PA to a PO position in SSD GEO/10 (Faculty of Engineering)
- 7) Promoting a RU to a PA position in SSD GEO/03 (Faculty of Sciences)
- 8) Promoting a RU to a PA position in SSD GEO/06 (Faculty of Sciences)
- 9) Hiring a PO in SSD GEO/03 (Faculty of Engineering) from another University
- 10) Hiring a PA in SSD GEO/02 (Faculty of Agronomy) from another University

As a result of above operations, in mid-2009 the Faculty staff of the DG should be as follows:

SSD		GEO/01	GEO/02	GEO/03	GEO/04	GEO/05	GEO/06	GEO/07	GEO/08	GEO/09	GEO/10	GEO/11	ICAR	Total
Faculty of Sciences	PB	18	22	11	11	17	18	15	4	12		10	5	143
	PO	1	2	0	0	1	1	1	1	1	0	0	0	8
	PA	2	2	3	1	3	4	3	0	2	0	2	1	22
	RU	4	4	1	4	2	1	1	0	1	0	2	1	20
Other Faculties	PB		3	4	4		4	3			4			22
	PO			1	1		1				1			4
	PA		1					1						2
	RU													0

Situation at June 30, 2008 including positions open for selection (expected to be finished in mid-2009)

In addition to the above operations, and considering the expected retirements (October 2008) of 2 Full Professors (SSDs GEO/02 and GEO/06) and of an Associate Professor of SSD ICAR/07, we expect at least the following actions within 2010:

- 1) Hiring a RU in SSD GEO/07 (Faculty of Sciences);
- 2) Hiring a RU in SSD GEO/08 (Faculty of Sciences);
- 3) Promoting a PA to PO in SSD GEO/03 (Faculty of Sciences);
- 4) Promoting a PA to PO in SSD GEO/11 (Faculty of Sciences).

With these last operations, the DG Faculty staff should result in 2010 as below:

SSD		GEO/01	GEO/02	GEO/03	GEO/04	GEO/05	GEO/06	GEO/07	GEO/08	GEO/09	GEO/10	GEO/11	ICAR	Total
Faculty of Sciences	PB	18	18	12	11	17	14	17	6	12		11	2	135
	PO	1	1	1	0	1	0	1	1	1	0	1	0	8
	PA	2	2	2	1	3	4	3	0	2	0	1	0	20
	RU	4	4	1	4	2	1	2	1	1	0	2	1	23
Other Faculties	PB		3	4	4		4				4			22
	PO			1	1		1				1			4
	PA		1											2
	RU													0
Resulting PB		18	21	16	15	17	18	17	6	12	4	11	2	157
MTAA		18	22	14	16	16	16	20	6	12	4	11		155

This schedule, which we consider feasible, allows to closely accomplish, already in 2010, the Faculty staff planned in MTAA post-2010 (see above). The noteworthy aspect of this schedule is that we are enjoying more resources (157 PB) than originally expected (155 PB), despite the contraction of the Faculty staff in Italy and in the UP. The strong contraction of the DG staff in the Faculty of Sciences (from 165 PB in 1994 to 135 PB) has been compensated by our increased presence in other Faculties (22 PB compared with 12 PB in 1994). In addition, a further merit of the plan is the strong enlargement of the number of young Assistant Professors.