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VESUVIUS

EDUCATION, SECURITY AND PROSPERITY

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PREFACE

Vesuvius is today surrounded by a densely populated area. Within a radius of 10 km of the crater live about one million people and within this distance and 50 km live another two million people, with the city of Naples being situated between Vesuvius on the east and the Phlegraean Fields on the west. In the last 20 000 years, this volcano has produced many plinian and smaller scale eruptions, and is most famous for its eruption in 79 A.D. when it buried the Greco-Roman towns of Pompeii and Herculaneum. Its 1631 subplinian eruption was even more devastating for the surrounding territory and for the first time made an important imprint on the Europeans during the Age of Reason or Enlightenment in the seventeenth and eighteenth centuries. Following this eruption, Vesuvius remained active until 1944 with its many strombolian and lava flow eruptions. Since 1944, the presence of smoke has disappeared and the surrounding territory began to be veiled in asphalt and concrete, with the smoke remaining a postcard memory and the eruptions a distant foreboding.

Vesuvius sleeps today and only some faint fumaroles within the crater and low-level seismic activity below its cone suggest that this mountain of fire is preparing for another of its colossal eruptions that could affect hundreds of thousands, if not millions, of people. Computer simulations predict that there is a high probability of a subplinian or plinian eruption occurring in the twenty-first century. For five centuries or more before the eruptions of 79 A.D. and 1631, the volcano remained quiescent and the people became complacent as the memory of past eruptions was gradually forgotten. A similar situation can occur again. Indeed, according to *Osservatorio Vesuviano* in Naples and its parent institution *Istituto Nazionale di Geofisica e Vulcanologia* in Rome '*Tutto è sotto controllo*' ('everything is under control'), thanks, so they claim, to the instruments that monitor the volcano and an evacuation plan that will allow everybody to escape on time during an emergency. This is, of course, an illusion due to the difficulty of separating tectonic from volcanic events, rapid rise of magma when the premonitory signals become clear that the volcano is erupting, and gross unreliability of the evacuation plan which to date has produced little peace of mind to many Vesuvians and no social and cultural progress that would emancipate hundreds of thousands of people from their difficult predicament. Meanwhile, the population around the volcano is becoming more complacent and many are convinced that Vesuvius will not erupt again. While it would be erroneous to promote a policy of eminent danger when this danger does not exist, it is equally erroneous to promote a policy of inaction, especially since we know that it is only a matter of time before Vesuvius wakes up.

A decade ago an interdisciplinary project called VESUVIUS 2000 was proposed for the Vesuvius area. Unlike evacuation plans which tend to manage emergencies, this initiative aims at preparing the territory around Vesuvius to confront volcanic emergencies with minimum socio-economic and cultural consequences. What Vesuvians need is not so much a plan that tells them where to run in the event of an

eruption, but the creation of an environment that offers security from future eruptions. VESUVIUS 2000 aims at achieving this objective while, at the same time, reducing the current state of social decay that is associated with limited economic opportunities. The danger from the volcano can be taken to advantage for producing a whole new secure and prosperous habitat for the people surrounding Vesuvius. The current evacuation plan has produced an unprecedented damage to the Vesuvius area, and, as long as it is being used as an instrument that only benefits special groups, there will be no prosperity for Vesuvians and these people will have to depend on their St. San Gennaro for protection. Since 1995, many Vesuvians have been educated on different risk management plans for the territory, but neither Italy nor the European Union has taken the Vesuvius problem seriously. Since Vesuvius is 'under control' why bother to produce a safer and more prosperous habitat for Vesuvians?

A forum on VESUVIUS 2000, held on 2 and 3 September 2004 in Villa Campolieto in Ercolano, near the ruins of Herculaneum, provided an impetus to complete this book. The forum was attended by over one hundred local and foreign scientists, educators, students, and some authorities and lay people from the Vesuvius area. Its principal organizers, besides myself and members of my organization GVES, were Giuseppe Luongo, Giuliano Panza, and Bernadette de Vanssay from the Universities of Naples, Trieste, and Paris V, respectively. The first day of the forum involved technical sessions and the second one excursions to the ruins of Pompeii and Villa Augustus on the opposite side of the Monte Somma relief. The presentations at the forum were multidisciplinary and dealt with the structure of the volcanic system, modeling of eruption processes, education, socio-economic conditions, and civil protection. The excursions to Pompeii and Villa Augustus clearly demonstrated our fragility and weakness when confronting nature and our complacency with danger.

This book should be useful to professionals and nonprofessionals alike, and, especially, to the populations of the Vesuvius area and other places around the world that face similar problems. It should also prove useful to those who want to familiarize themselves with the geographical, social, and cultural settings of the area, as well as to those who wish to know about the current understanding of the substructure of the volcanic system, the objectives of global volcanic simulation, and difficulties involved in managing risk in densely populated areas. The book should also be useful to educators, who teach primary, intermediate, and secondary school children and students about their environment, and volcanoes in particular.

Because of the multidisciplinary issues considered here, students, professionals, lay public, and civil protection managers should find in this volume sufficient information for further study, elaboration of topics, or adaption to their particular situations. The objectives of VESUVIUS 2000 need to be diffused to an audience beyond the Vesuvius area, for critical evaluation and comparison with analogous initiatives. We cannot embark on a serious path of risk mitigation in a densely populated area unless we fully understand the history, culture, and socio-economic conditions of the area and are willing to scrutinize every detail of our intended actions and fully expose our projects to constructive criticism. A mitigation and risk

management plan which is hidden from the public, and its architects refuse to discuss it publicly and away from professional audience, does not serve any useful purpose, especially for those living in the close proximity of Vesuvius.

The book is divided into seven chapters, with each chapter providing a summary in both English and Italian. Following this preface, the book provides an extended summary of VESUVIUS 2000 in Italian. The Appendix of Chapter 2 is in Italian and provides a global perspective of the territory as seen by a group of intermediate students of the Vesuvius area. The Appendix of Chapter 3 is the Italian version of this chapter. The color versions of black and white figures of in Chapter 2 are collected at the end of the book, and the extensive Notes in Chapters 1 and 2 elaborate on the historical, cultural, and scientific aspects of the area and beyond.

Chapter 1 presents the difficulties associated with the management of volcanic risk in the Vesuvius area and the principal objectives of VESUVIUS 2000 which aim at transforming the area into a secure and prosperous region. The topics in this chapter deal with Vesuvius consciousness, security culture barriers, habits of mind that prevent the Vesuvians from judging different risk reduction strategies, the grand challenge associated with the protection of people and territory from the volcano, and VESUVIUS 2000 objectives and methodologies. VESUVIUS 2000 is divided into three interrelated topics: Physical environment, which deals with the development of Global Volcanic Simulator and its use for assessing the effects of different eruption scenarios; population, which addresses the social, economic, and educational issues of the people; and territory, which deals with the area infrastructures, urban planning, and civil protection.

Education of children and adults so that they become Vesuvius-conscious citizens is discussed in Chapter 2. Different age groups of students imagine things differently, and it is the aim of education to take advantage of those tools which produce the greatest developments in children. This chapter thus addresses the cognitive tools available to us and how these tools can be used to educate the primary, intermediate, and secondary school children about Vesuvius. We, therefore, discuss educational ideas, kinds of understanding, educational methods, and teaching methodologies. Educating adults about Vesuvius is also important, especially in decreasing their technological illiteracy, because this is preventing many from seeing how the modern technology can liberate them from their difficult predicament. As examples, we discuss several educational efforts in the Vesuvius area, including those from schools, nonprofit and professional organizations, lay public, and others.

The social and economic reality of the Vesuvius area is addressed in Chapter 3. Eighteen communities of more than 500 000 people border the crater of the volcano and, during the last decade, some 30 000 people have left the area for better opportunities and lower risk elsewhere. The educational level of most people living near the volcano is low and, officially, only one-fifth of the population works. Their main economic activities are services, scattered agriculture, and some manufacturing. This kind of environment breeds crime and offers few bright prospects for future generations.

Chapter 4 presents geophysical precursors of Vesuvius from historical and archeological sources. The eruption of Vesuvius in 79 A.D. was preceded by a large magnitude earthquake in 62 A.D. that caused an extensive damage. This and several other events thereafter suggest that the towns surrounding the volcano experienced significant problems before this famous eruption. The eruption of 1631 was also preceded by seismic activity for several hours, and perhaps for a longer time. The last significant earthquake occurred in 1999 and the recent seismicity has been maintained below the magnitude 4 on the Richter scale.

The characteristics of ballistic debris emitted from Vesuvius during the eruption of 79 A.D. are discussed in Chapter 5. This debris, with block sizes of up to 1 m, is common in the deposits of this eruption and reached distances in excess of 10 km from the crater. Modeling of the ballistic shower is, however, in its infancy and not reliable enough to be used today as a tool for the hazard assessment associated with this kind of material being ejected from the volcano.

Our current understanding of the substructure of Vesuvius and that of the nearby Phlegraean Fields is presented in Chapter 6. This understanding comes from the natural seismicity of the volcano and seismic tomography experiments that have been conducted in the 1990s. At that time, I was one of the promoters of such experiments for collecting data that could be used for the validation of Global Volcanic Simulator. Since then, many such studies have been made and their results suggest that both the Vesuvian and Phlegraean areas have low seismic wave velocity layers at a depth of about 10 km and that, therefore, there is no evidence of magma in the superficial regions of the volcano. According to these works, the volcanic conduit is currently sealed and magma resides in a diffused crustal magma reservoir which is fed by a regional one within the uppermost mantle.

Global Volcanic Simulator is the key tool for both ascertaining the effects of different eruption scenarios on the territory surrounding the volcano and producing a new habitat for Vesuvians where they can live safely from future eruptions. In Chapter 7, we discuss physical modeling, numerical, and computer implementation issues related to the development of such a simulator. We have already developed several useful models for simulating magma chamber dynamics and magma ascent in volcanic conduits, and are currently developing a nonequilibrium multiphase and multicomponent atmospheric dispersion model and its associated computer code. This model accounts for two-way turbulence coupling between the gaseous and particulate phases, condensation and evaporation of volatiles, aggregation and fragmentation of pyroclasts, and chemical reactions among the components of different phases. Our objective is to resolve the effects of pyroclastic flows on small and large structures located on the territory surrounding the volcano, determine the fallout characteristics of tephra and ballistic blocks, and ascertain the consequences of plinian plumes transporting the volcanic debris high into the stratosphere during and after an eruption. A practical global simulator must be able to simulate different eruption scenarios and determine their effects on the people and infrastructures, with and without engineering measures aimed at protecting the area surrounding the volcano.

During the last decade, we have only made a modest progress in achieving the objectives of VESUVIUS 2000, because of a politicized evacuation plan that distances independent initiatives and stifles collaboration on this volcano. We have made, however, a significant effort in promoting education and collaboration, and managed to involve many schoolteachers and their students on different topics associated with Vesuvius. Regretfully, the people's representatives in Italy are using the flawed evacuation plan as an instrument for discharging their own responsibility, while the institutions of higher learning and research centers are not sufficiently responsive to help design a safe and prosperous habitat for Vesuvians. We need to get rid of negative habits of mind and force ourselves beyond our personal interests and traditions, and thus attempt to construct a higher level of civilization. VESUVIUS 2000 proposes a technologically-grounded approach to territorial risk management which is dramatically different from other plans. As a consequence, it needs time to bear fruit to the people whose ancestors are the founders of Western Civilization.

Flavio Dobran
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Flavio Dobran

Vesuvius
F. Dobran (Editor)

Chapter 2

Education: Cognitive Tools and Teaching Vesuvius

F. Dobran

The uniqueness of humanity could be said to rest not so much in language as in our capacity for rapid cultural change ... [W]hat humans evolved was primarily a generalized capacity for cultural innovation.[1]

L'unicità dell'umanità non si basa tanto sulla lingua, quanto sulla nostra capacità per rapido cambiamento culturale ... Quello che gli esseri umani evolsero è stato primariamente una capacità generalizzata per l'innovazione culturale.[1]

—Merlin Donald (1993)

ABSTRACT

The educational process is shaped by evolutionary developments in the distant past and cultural developments of more recent times. We are born with certain survival or mimetic qualities which allow for conscious representational acts without the need for language symbols. These qualities allow for the initial understanding of the world and remain with us for the rest of our lives. With the adoption of language, the world begins to be shaped with the tools of mythic understanding, such as binary opposites, rhythms, and fantasy. As we become more fluent in language around the age of 10, we begin to associate with the limits and extremes of reality, and qualities of heroes that transcend human experiences. Around the age of 15, we begin forming connections among things and want to know the causes and processes leading to the effects and consequences. This philosophic understanding seeks to describe the world in terms of general schemes and theories, but the majority of us do not reach this potential development of the educational process.

The old educational ideas of rigid curriculum, natural education, and socialization are not only mutually incompatible, but also inadequate when applied individually to the learning process. We want our students to conform to the Platonic ideal of acquiring privileged knowledge and Rousseauian encouragement that they discover their own potentials, but we also want that they adapt to the norms and values of the society. Students of different age groups imagine reality in different ways, and what the teachers must do is to use those cognitive tools that allow the maximum development of each pupil. The external culture functions as a tool for

the internalization of external symbols in every individual, and the more forcibly this is used the more developed our minds become.

The educational process dealing with Vesuvius is not taking the full advantage of such educational tools, but there are sporadic examples where this is achieving successes. In this chapter, some of these tools are presented as methodologies that can be applied to teaching the volcano in primary, intermediate, and secondary schools of the Vesuvius area. The majority of Vesuvians are, however, poorly educated about the volcano and what needs to be accomplished to live in security and prosperity. The technological illiteracy is preventing the Vesuvians from judging whether to wait passively for an eruption and then attempt to escape, or begin to prepare the territory to confront the eruption with minimum social, economic, and cultural consequences. Since we can program our brains with external symbols of the society in which we live, all that is needed is willingness and steadfast persistence to diffuse serious education on Vesuvius in the direction of technological literacy and away from resignation and negative habits of mind.

RIASSUNTO

Il processo educativo si forma con gli sviluppi evolutivi del lontano passato e gli sviluppi culturali dei tempi più recenti. Noi siamo nati con certe qualità per sopravvivere o con qualità mimetiche che permettono rappresentazioni di azioni coscienti senza il bisogno dei simboli linguistici. Queste qualità permettono la comprensione iniziale del mondo e rimangono con noi per il resto della nostra vita. Con l'adozione del linguaggio, il mondo comincia ad essere delineato con gli strumenti della comprensione mitica, quali opposti binari, ritmi e fantasia. Quando diventiamo più sciolti nel linguaggio verso l'età di dieci anni, cominciamo a fare associazioni con i limiti e gli estremi della realtà e con le qualità di eroi che trascendono l'esperienze umane. Verso l'età di quindici anni cominciamo a formare legami tra le cose e vogliamo conoscere le cause e i processi che portano agli effetti e alle conseguenze. Questa comprensione filosofica cerca di descrivere il mondo in termini di schemi e di teorie generali, ma la maggioranza di noi non raggiunge questo sviluppo potenziale del processo educativo.

Le vecchie idee educative di un rigido curriculum, l'educazione naturale, e la socializzazione sono non solo incompatibili, ma sono anche inadeguate se applicate individualmente al processo di apprendimento. Vogliamo che i nostri studenti si conformino all'ideale Platonico di acquisire una conoscenza privilegiata e seguiamo un incoraggiamento Rousseiano affinchè essi scoprano le loro potenzialità, ma vogliamo anche che essi si adeguino alle norme e ai valori della società. Gruppi di studenti di età diversa immaginano la realtà in maniera diversa e ciò che gli insegnanti devono fare è usare quegli strumenti cognitivi che permettono il massimo sviluppo di ciascun alunno. La cultura esterna funziona come strumento per l'interiorizzazione di simboli esterni in ogni individuo e quanto più si usa in maniera energica, tanto più le nostre menti si sviluppano.

Il processo educativo sul Vesuvio non trae pieno vantaggio da questi strumenti educativi, ma ci sono esempi sporadici in cui questo processo sta raggiungendo qualche successo. In questo capitolo alcuni di questi strumenti sono presentati come metodologie che si possono applicare all'insegnamento del vulcano nelle scuole elementari, medie e superiori dell'area vesuviana. La maggioranza dei Vesuviani sono comunque poco educati sul vulcano e su ciò che è necessario compiere per vivere in sicurezza e prosperità. La mancanza di cultura tecnologica sta impedendo ai Vesuviani di valutare se aspettare passivamente l'eruzione e poi tentare di scappare o cominciare a preparare il territorio per confrontare l'eruzione con minime conseguenze sociali, economiche e culturali. Dal momento che possiamo programmare le nostre menti con simboli esterni della società in cui viviamo, tutto ciò che è richiesto è la volontà e la risoluta persistenza a diffondere una educazione seria sul Vesuvio nella direzione di istruzione tecnologica e dello stare lontani dalla rassegnazione e da abitudini negative della mente.

Da tumultuosi e spesso contraddittori stati della mente, una mente illuminata deve selezionare ciò che è essenziale e vitale e ridurre l'importanza di ciò che è banale e secondario. L'evoluzione della mente è derivata sia dallo sviluppo del cervello che dal contemporaneo sviluppo della cultura. Per parecchi milioni di anni questa evoluzione è stata lenta. Durante gli ultimi 30.000 anni circa e con la velocità sempre crescente degli ultimi 3000 anni, l'evoluzione del cervello non è proceduta in sequenza con lo sviluppo culturale. Ciò che è stato appreso in una generazione è passato alla successiva. La natura ci ha fornito di strumenti per trascendere la biologia, ma i nostri sistemi educativi non hanno ricavato pieno vantaggio dalla nostra capacità di apprendimento. Prima del XIX secolo l'educazione era riservata ai privilegiati ed era portata avanti in privato dai tutori, ma la rapida crescita della popolazione, lo sviluppo industriale e la creazione di una nuova e prosperosa classe media più avanti nel secolo richiedeva un nuovo sistema per educare i discendenti di questa classe. L'educazione privata fu sostituita dall'educazione di massa e da allora stiamo lottando su come sia meglio educare i nosti figli con il sistema di scuola pubblica.

Le scuole dell'area vesuviana hanno fallito nel produrre un pubblico che sia capace di assicurare la sopravvivenza delle sue strutture sociali e culturali e, come risultato, abbiamo una crisi dell'educazione i cui costi, in termini d'ignoranza delle possibilità delle esperienze umane, sono incalcolabili e strazianti. Troppe istituzioni educative stanno fallendo nel diffondere tra i giovani non soltanto la corretta informazione sul vulcano e sui suoi dintorni, ma anche tralasciando di affrontare quelle barriere culturali di sicurezza che impediscono lo sviluppo di individui consapevoli del vulcano. Il risultato finale di tale fallimento è una popolazione incapace di valutare come scappare dall'inferno della deteriorazione culturale e sociale e da una trappola naturale che si può affrontare solo con la tecnologia moderna. A causa delle abitudini mentali negative e dell'insufficiente sforzo indirizzato a superare queste abitudini, sia gli educatori che quelli che li formano devono risvegliarsi dal loro torpore e assumere seriamente le proprie responsabilità prima che il vulcano cominci di nuovo, con boati, ad impossessarsi del suo territorio. Ci sono

segnali positivi che questo risveglio stia prendendo piede a livello popolare, ma noi siamo lontani da un processo educativo fondato sulla prevenzione o da una politica del territorio che sia capace di produrre la struttura sociale necessaria per affrontare le future eruzioni del Vesuvio in sicurezza e prosperità. Poichè troppi educatori ed amministratori territoriali non sono sufficientemente impegnati in questo tentativo, noi abbiamo un pubblico demotivato, con mentalità fatalista e che crede di poter essere salvato dal santo napoletano San Gennaro.

Quindi, chi è responsabile della mancanza di questa educazione? Sono forse gli insegnanti, perchè inadeguatamente preparati per il loro compito sul Vesuvio e sulle sue conseguenze? La mancanza di incentivi per i docenti? Uno scarso curriculum riempito con programmi di rilevanza immediata? La mancanza di controllo locale sulle scuole? La scarsa educazione degli adulti, le cui abitudini mentali negative ricadono sui giovani? Il timore di confrontare le abitudini negative dei Vesuviani, o i miopi amministratori pubblici, le cui barriere mentali impediscono loro di superare l'incommensurabile paradosso? Dovrebbero forse essere più concreti i tirocini degli insegnanti, più attivo il coinvolgimento degli studenti e dei loro genitori, più cospicui gli incentivi per gli insegnanti, più effettiva l'educazione da parte dei massmedia, più grande la coerenza nel processo educativo, o più chiara la comprensione del perché alcuni metodi educativi funzionano ed altri no? Queste eventuali colpe e queste prescrizioni per la soluzione rischiano di portare verso tale domanda: il problema esiste nei metodi di educazione o nel sistema che fallisce nella realizzazione dei metodi nella maniera giusta?

Il sistema educativo ha lo scopo di accrescere la competizione delle nazioni e di formare dei cittadini. Si suppone che questi obiettivi giustifichino l'enorme investimento in risorse anche se i risultati non sempre sono quelli attesi. L'educazione di massa nell'Occidente ha poco più di cento anni e con essa il livello di analfabetismo tra il pubblico profano è diminuito rapidamente. Quando l'Italia si unificò nel 1870 il 70% della popolazione era illetterata, entro la fine del XX secolo si è ridotta al 5% nell'area vesuviana, e al 2% nella nazione. Oltre a questo problema di base dell'analfabetismo ancora alto se paragonato agli stati del nord Europa, c'è ancora un 'analfabetismo tecnologico' molto più grande e non documentato, la cui gravità non è stata presa in considerazione nè dal sistema educativo nè dall'apparato politico. Eppure la soluzione della difficile situazione dei Vesuviani dipende dall'uso delle innovazioni culturali moderne, i cui elementi indispensabili sono alcuni dei metodi e delle tecniche recentemente messe a punto dalla comunità scientifica.

La lotta per allontanarsi dalle pressioni evolutive e culturali del passato ed adattarsi alle condizioni affrontate dalle società attuali non è nuova e fu affrontata dalle prime culture orali con l'invenzione di tecniche per assicurare che i giovani avrebbero imparato e ricordato la mole di conoscenze del gruppo sociale, da Platone quando introduceva un curricolum cinquantennale di una crescente conoscenza astratta e disciplinata, e da Rousseau con l'enfatizzare che la scoperta propria dello studente è molto più efficace delle parole del tutore. Più recentemente, Durkeim ha enfatizzato che la scuola è obbligata a preparare un individuo socialmente consapevole; Dewey ha messo sullo stesso piano lo sviluppo psicologico,

la scolarizzazione e il cambiamento sociale; Vygotsky ha enfatizzato che l'educazione deve essere messa sullo stesso piano sia delle funzioni psicologiche degli studenti, che della cultura in cui essi sono immersi; ed Egan che ha suggerito che la più grande speranza di tenere l'energia educazionale viva, dopo i primissimi anni, è 'stimolare l'immaginazione' dell'individuo o del gruppo a cui viene insegnato. Mentre il metodo Platonico sembra essere parte della soluzione, è di per sè troppo rigido e fragile. I metodi di tipo Roussoniano producono anch'essi problemi, perché privano il fanciullo della ricchezza della comprensione e falliscono per stimolare la maggioranza degli adulti. Lo stimolare l'immaginazione del gruppo di ogni età in maniera diversa dalla cultura in cui il gruppo è immerso è forse il miglior metodo per trarre vantaggio da ciascun metodo educativo e noi vedremo come questo sia applicato sporadicamente nell'area vesuviana. Vedremo come questo approccio produce connessioni tra lo sviluppo culturale del passato ed il requisito del presente, e mostreremo come applicarlo a livello pratico. Ma il problema di come diffondere queste esperienze ampiamente sul territorio, in assenza di direttive ufficiali e di incentivi, rimane una sfida da risolvere. Gli obiettivi educativi del progetto VESUVIUS 2000 stanno sostenendo questa sfida dal 1995 aiutando a preparare gli individui con maggiore consapevolezza del Vesuvio e capacità per affrontare realisticamente il problema, invece di produrre individui compiacenti, falsamente sicuri e che aspettano di fuggire dal vulcano.

Al fine di colmare le deficienze del sistema educativo e tendere alla creazione di individui consapevoli del Vesuvio, abbiamo bisogno di discutere diversi tipi di idee educative e di come questi abbiano dato forma ai valori occidentali, riflettere su queste idee e valutare la loro rilevanza nell'affrontare il rischio vulcanico, e presentare esempi del territorio in cui alcune di queste idee sono praticate consapevolmente o inconsapevolmente. Dobbiamo anche suggerire metodi per adottare un curriculum più rilevante e discutere sulle implicazioni per insegnare ai giovani nelle scuole e agli adulti a livelli diversi della società. Questo viaggio ci porterà dai nostri inizi umani come raccoglitori di cibo con limitate abilità per le innovazioni culturali alla società tecnologica moderna, con scolarizzazione di massa, complesse strutture sociali, e rapidi cambiamenti culturali. Dobbiamo anche prendere in considerazione l'analfabetismo tecnologico del pubblico, perchè la tecnologia moderna è frutto di uno stato complesso tra scienza, ingegneria, etica, economia, legge, politica, ed altri fattori. VESUVIUS 2000 richiede un pubblico tecnologicamente preparato con conoscenza, modi di pensare e di agire, e capacità di produrre e mantenere un ambiente sostenibile. Dal momento che questa iniziativa è stata lanciata sul territorio una decina di anni fa, un certo progresso è stato già fatto in questa direzione, ma molto rimane da fare e non vi è struttura sociale migliore delle scuole per intraprendere questa sfida.

2.1. INTRODUCTION

From among the tumultuous and often contradictory states of mind an enlightened mind selects that what is essential and vital, and plays down the importance of

trivial and secondary. The mind's evolution has been a product of both the brain and of culture developing together, and for several million years this evolution has been slow. During the last 30 000 years or so, and with ever-increasing speed in the past 3000 years, the brain's evolution has proceeded out of sequence with cultural development. What has been learned in one generation has been passed to the next. Nature has supplied us with the tools to transcend biology, but our educational systems have not been taking full advantage of our learning capacity. Before the nineteenth century, education had been reserved for the privileged and was carried out in private with tutors, but the rapid population growth, industrial development, and the founding of a new and prosperous middle class later in the century, a new educational system was required to educate the offspring of this class. The private education was replaced with mass education and ever since we have been struggling how best to educate our children by the public school system.

The Vesuvius area schools have failed to produce a public that is capable to ensure the survival of its social and cultural structures, and as a result we have an educational crisis whose costs, in terms of the ignorance of the possibilities of human experiences, are incalculable and heartbreaking. Too many educational institutions are failing to diffuse through the young not only the correct information about the volcano and its surroundings, but also neglecting to confront head-on those security culture barriers which are impeding the development of volcano-conscious individuals. The end result of this failure is a population that is unable to see how to escape from the ever closing-in inferno of social and cultural deterioration, and a natural trap that can only be confronted with modern technology. Due to the adverse habits of mind[2] and insufficient effort being undertaken to overcome the barriers associated with these habits, both the educators and those who form them must reawaken from their slumber and take seriously their responsibilities before the volcano begins roaring again and taking possession of its territory. There are positive signs that this reawakening is taking hold at the grass-roots level, but we are far from an agreed-upon educational process or policy for the territory that is capable to produce the necessary social structure which can confront future eruptions of Vesuvius in security and prosperity.[3] Since too many educators and territorial administrators are not being engaged enough in this effort, we have a public with eroded souls, fatalistic mentality, and believing in the Neapolitan savior San Gennaro[4] (Fig. 2.1).

So who is responsible for this lack of educational effectiveness? Are the blameworthy candidates the schoolteachers because they are inadequately prepared for their task on Vesuvius and its consequences, the absence of incentives for teachers, a trivial curriculum filled only with the immediately relevant, the lack of local control over schools, a lack of commitment to excellence, poor education of adults whose negative habits of mind are spilling over onto the young, the fear of confronting adverse habits of mind of Vesuvians, the short-sighted public appointees whose mental barriers prevent them from overcoming the incommensurability paradox?[5] Should the prescriptions be more effective teacher training, more active involvement of students and their parents, greater incentives for teachers, more effective education from mass media, a greater coherence in the educational process, a clear

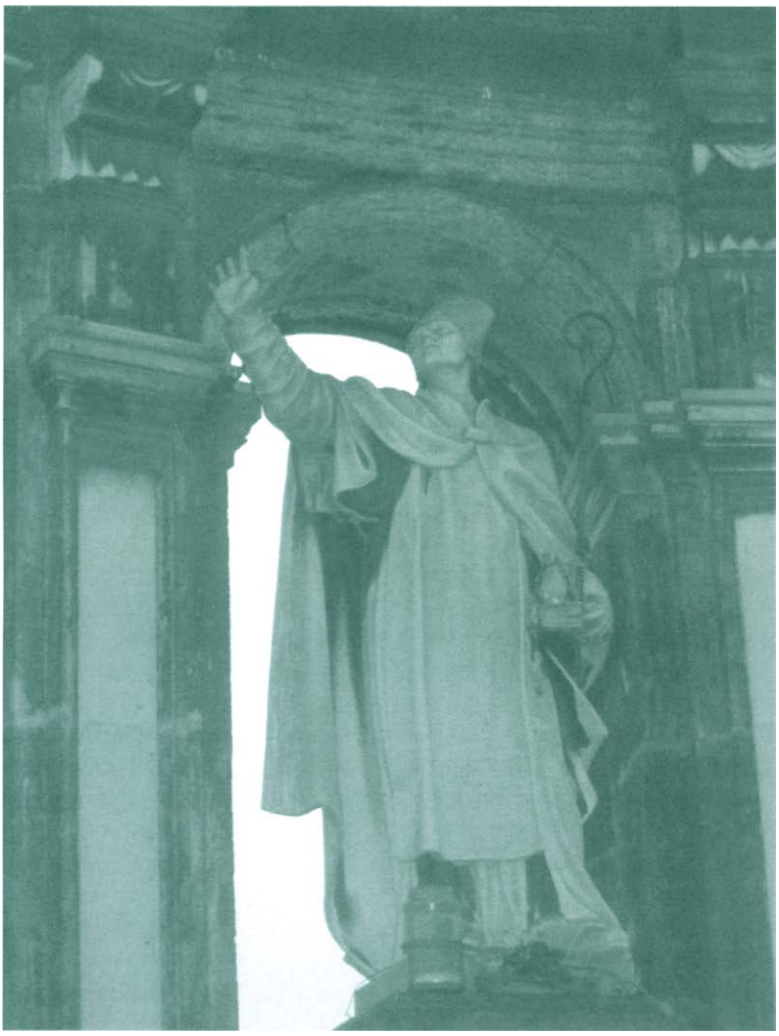

Fig. 2.1. A statue of San Gennaro on Ponte della Maddalena in Naples. The Saint is facing Vesuvius and with the hand raised symbolizes his ability to stop the furies of the volcano.

understanding of why some educational methods work and others don't? These blames and prescriptions can go back and forth and risk from concluding whether the problem lies in the educational methods or in the system that fails to implement the methods properly.

The goals of the educational system are to enhance the competitiveness of nations and the self-fulfillment of citizens. These goals are supposed to justify the enormous investment in resources, but there is hardly anybody who is content with the educational system, both inside and outside of it. Mass education in the West is little more than 100 years old and with it the illiteracy level among the lay public

diminished rapidly. When Italy unified in 1870, 70% of the people were illiterate and by the end of the twentieth century this has been reduced to about 5% in the Vesuvius area and 2% nationally.[6] Besides this basic illiteracy problem which is still high in comparison to the northern European states, there is a much larger and undocumented 'technological illiteracy' where neither the educational system nor the policy-making apparatus have recognized its importance. And yet the solution of the difficult predicament of Vesuvians crucially depends on the use of modern cultural innovations whose staple are some of the methods and techniques of latest scientific discoveries and practical inventions.

The struggle to break away from the evolutionary and cultural pressures of the past and adapt to the conditions faced by current societies is not new and was faced by the early oral cultures by inventing techniques to insure that the young would learn and remember the social group's store of knowledge, Plato when he introduced a 50-year curriculum of increasing abstract and disciplined knowledge, and Rousseau by emphasizing that the student's own discovery is vastly more effective than the tutor's words. More recently, Durkheim has emphasized that the school has the obligation to prepare a socially-conscious individual; Deway has linked psychological development, schooling, and social change; Vygotsky has emphasized that education must be linked with both the students' psychological functions and culture that they are immersed into; and Egan who has suggested that the best hope of keeping the educational energy alive after the very early years is to 'stimulate the imagination' of the individual or group being taught.[7] While the Platonic method appears to be a part of the solution, it is by itself too rigid and too fragile. The Rousseauian-type methods produce problems too because they deprive the child from learning the richness of understanding and fail to stimulate the majority of adults. By stimulating the imagination of each age group differently with the culture in which the group is immersed is perhaps the best way of taking the advantage of each educational method, and we will see how this is being applied sporadically in the Vesuvius area. We will see how this approach produces connections between the cultural development of the past and requirement of the present, and show how this is being applied at practical levels. But the problem of how to diffuse these experiences widely on the territory in the absence of official directives and incentives remains a challenge to be solved. The educational objectives of VESUVIUS 2000[3] have been confronting this challenge since 1995 by helping to prepare individuals with greater Vesuvius consciousness and abilities to confront the challenge ahead, instead of producing individuals with complacency, false security, and waiting to escape from the volcano.

Toward the goal of improving the deficiencies of the educational system which is conducive to the creation of Vesuvius-conscious individuals, we need to discuss different types of educational ideas and how these have shaped our Western values, reflect on these ideas and evaluate their relevance in confronting the volcanic risk, and present examples from the territory where some of these ideas are being practiced, either consciously or subconsciously. We also need to suggest ways for adopting a more relevant curriculum and discuss implications for teaching the young in the schools and adults at different levels of the society. This journey will

take us from our human beginnings as food gatherers with limited abilities for cultural innovation into the modern technological society with mass schooling, complex social structures, and rapid cultural changes. We also need to confront the technological illiteracy among the lay public, because the modern technology is the fruit of a complex interplay between science, engineering, ethics, economics, law, politics, and other factors. VESUVIUS 2000 requires a technologically literate public with knowledge, ways of thinking and acting, and capabilities to produce and maintain a sustainable habitat.[3] Since this initiative was launched on the territory a decade ago, some progress in this direction has already been made, but much remains to be accomplished and there is no better social structure than the schools to take up this challenge.

2.2. EDUCATIONAL IDEAS

The modern school is supposed to provide a place for socializing the young, for teaching particular kind of knowledge that will bring about a realistic and rational view of the world, and develop the maximum potential in each child. Although these goals are complementary, any one of them is incompatible with the other two, because the more we try to develop one the more we neglect the other two; and it is because of this incompatibility that the educational process shifts from time to time in different directions and causes our long-continuing educational crisis.[8] Education is intrinsically tied in the life and culture of a society, and since the humans, and young children in particular, have a large capacity for rapid cultural growth or adaptation to their surroundings, there is little doubt that with proper education we can get rid of negative habits of mind and develop new ones that are conducive for the growth of our species. The Vesuvius consciousness[3] that needs to be produced at all levels of the society should have the basis in an educational system that, in a coherent manner, takes advantage of our educational goals and experiences of our culture and cognitive advantage of different groups of children and adults. This 'sequence of understanding' permits learning of the same concept over and over again from different perspectives during the cognitive development years of the young and forming well-rounded individuals before entering into the world of adults. Knowledge exists only in human minds, and only through our minds can we connect with our hopes, fears, desires, and intentions to confront the multifaceted nature of the volcano and its surroundings, and, hopefully, produce suitable leaders of tomorrow who will be able to take concrete actions on the territory.

2.2.1. Socialization

In his ground-breaking study of the sociology of education, Emile Dunkheim (1858–1917) declares that 'a given advance in moral education in the direction of greater rationality cannot occur without also bringing to light new moral tendencies, without inducing a greater thirst for justice, without stirring the public conscience by latent aspirations'.[9] The educator must help the young become conscious

of the new ideal; he must prepare them for the future. The new society that needs to be formed must be greater than the sum number of its individuals and this cannot exist unless its members are sufficiently alike; they all must reflect, in different degree, the characteristic essential of the sought-for ideal, an ideal that surpasses the self-centered interests of each member of the society. Education through the direct experience influences both the moral and intellectual elements of culture, and in helping to produce such a culture the teacher must train the young minds to cherish its social structure. This cannot be achieved without imprinting a discipline and spirit in each child; to make him understand 'his country and his times, to make him feel his responsibilities, to initiate him into life and thus to prepare him to take his part in the collective tasks awaiting him'.[10]

The mind of a young child is endlessly moving and his feelings change dramatically on short notice. Education must therefore account for this behavior in order for the young to conform to the social norms of the adults, and since changing the habits of the child is much easier than changing those of the adults, there is no better place than the school where socialization and adoption of new norms can take place.[11] Education within the family is inadequate for preparing the child for the active role within the society, and if one does not tend carefully to the habits of minds in the early years of an individual, one loses that very plastic mind which can be readily adapted to acquiring new habits. But this cannot be achieved without the teacher adopting an appropriate discipline whereby the child learns and respects the rules of school which are different and much less personal than within the nuclear family. By respecting these rules the child learns to respect the rules in general; he develops a habit of self-control and restraint which needs to guide him through his adult life. As a class is a small society it is crucial that it be disciplined, that the teacher exercises an authority that is respected by his students: An authority that does not come out from capital punishment, but through the teacher's transmitted words and gestures and imprinted on the child's mind. The students must understand that school rules are impersonal and that the teacher's actions are not of his own but those of the school. If the need be the teacher must also punish, but in such a way that 'it is the punishment that prevents discipline from losing this authority'.[12]

The role of the educator is to give the child the clearest possible idea of the social groups to which he belongs and this must be repeated on and on until it becomes an integral part of the child's mind. This is essential, for 'the citizen must have an inclination toward collective life'.[13] A society can survive and maintain its sense only if a certain degree of homogeneity is achieved in shaping its members, and education reinforces this homogeneity. The central role of the schools is, therefore, to produce graduates who understand their place in the world of the adults and who will perpetuate this society. This is accomplished by producing taxpayers, engineers, artists, mechanics, lawyers, economists, etc. Clubs, team sports, associations, and others also perform similar functions. To prevent the process of socialization and homogenization to become dehumanizing and totalitarian in its demands for conformity, the Western societies have built defenses into the school curricula, by limiting censorship and allowing for a wide range of subjects that develop the students' minds and give them a more realistic grasp of the world.

2.2.2. Platonic education

For Plato (c. 428–347 B.C.)[14] education should not be concerned primarily with putting knowledge into people's souls to produce in them good social beings equipped with the skills of good and effective citizens who conform to social norms, but to acquire those forms which would give them a privileged, rational view of reality. This, according to Plato, can be achieved through increasingly abstract forms of knowledge where the conventional beliefs and prejudices inherent of appetitive and spiritual desires are replaced by the rational desires for knowledge and truth; where 'the form of the good is the most important thing to learn about',[15] for a soul ruled by reason has to be just. Of course, not all in Plato's city of Kalliopolis can acquire this level of education and those who do not remain inferior with contemptible appetites that distort their perception of the good and chase them after things that can never make them happy.

To become true statesmen it is necessary to study music, poetry, mathematical sciences, dialectics, and politics, so that at the age of 50 those who have been successful in their studies can be 'compelled to lift up the radiant light of their souls'[16] to the good itself. For too many of us such a system would be repressive, because our freedoms would be restricted, but the message of Plato's ideal is clear: The schools should cultivate the young in ways that are beyond the required norms of social utility. The schools should include in the curriculum a range of subject matter in order to develop students' minds to their maximum potential, even if some knowledge will never be used by many in the real world. Indeed, such elitist schools should teach the students the appropriateness of the values, norms, and beliefs of the adult societies and prepare well-rounded individuals who would be best equipped to comprehend the multifaceted nature of the world and lead societies to higher social and cultural achievements. There is much to be said about this philosophic-type of education when preparing Vesuvians for the task at hand, and we will see shortly how and when this program of study should be implemented during the formal years of students' education.

2.2.3. Natural education

Jean Jacques Rousseau (1712–1778) focused his attention, instead, on the nature of the developing child. In *Emile*, Rousseau argues, '[t]he internal development of our faculty and organs is the education of nature. The use we learn to make of this development is the education of men'.[17] The children can comprehend only that which their mental capacities allow and by trying to teach them things that are beyond personal comprehension and appreciation can only produce harm to them. Rousseau believed that in the hands of dull educators Plato's rigidly structured curriculum can produce misery, frustration, and violence, instead of motivation, students' engagement, and active participation. Adults need to realize the children's mental and moral limitations, and the children must be allowed to act and think as persons in their own right if they are going to develop fully into adults. The education must be, therefore, child centered if it is going to be effective in making good human beings and through them a good society. As compared to Voltaire for

whom 'civilization' represents a common vision for all mankind as exemplified by France of Louis XIV and *Encyclopèdie*,[18] Rousseau's education meant liberating the young from the civilization.

The third type of education that we have encountered focuses on fulfilling the individual potential of each student, the encouragement of active rather than passive learning, the realization that the student's discovery is vastly more important that the teacher's words, that the student should not be presented with a rigid curriculum. For John Dewey (1859–1952), this educational process has two sides: Psychological and sociological. 'The child's own instincts and powers furnish the material and give the starting point for all education. ... Education, therefore, must begin with a psychological insight into the child's capacities, interests, and habits. These powers, interests, and habits must be continually interpreted – we must know what they mean. They must be translated into terms of their social equivalents – into terms of what they are capable of in the way of social service'.[19] The sociological process of education is subordinated to the psychological one and serves to properly interpret the child's powers.

2.2.4. Incompatibilities

Socrates was Plato's ideal of the educated person and was condemned by the democratic citizens of Athens because he was corrupting the youth with teachings that they should question the accepted norms of the society. For Socrates, the Athenian democracy lacked the virtues of a just society and by his death he wanted to prove that he is right.[14] Today no one believes that Plato's ideal aim of direct knowledge of the real, the true, the good, and the beautiful is attainable, but only the promise of this ideal. What is attainable is the skeptical, informed, and philosophical mind that inquires into the nature and meaning of things: A mind that is not satisfied by conventional answers and seeks rational explanations. We want social beings for our society to function, and we want the cultivation of the mind, the skepticism, and the dedication to Plato's program of rationality. Our schools of today are supposed to produce this kind of individuals.

The natural education of Rousseau is also in conflict with that of the Platonic model, because the latter is more structured, more rigid, more demanding, and more progressive. While the 'progressivists' argue the 'basics' and solid curriculum, the 'traditionalists' of Rousseau argue 'relevance' and space for students' exploration and discovery.[20] Modern society is permeated with mass media and distractions of all sorts and an individual can hardly develop 'naturally', but we do encourage that he develops somewhat as an individual in the Rousseauian sense.

The educational institutions are often pressured from groups who prefer one or another of the educational ideas and adapt by compromising to adequate socialization of students, reasonable academic program, and developing the potential in each student. This compromise shifts a little in one direction or another in response to social pressures, and neither the psychological nor the sociological side can be subordinated to the other or neglected, but according to Dewey the former is more basic. The school is primarily a social institution where the inherited resources of

the race are shared with the student; where the student is prepared to live present life and extend on the experiences of his home life. The teacher in the school is simply to select among the multitude of influences those that will assist the child in responding to these influences in as effective manner as possible. If education is life the student should progress both from the succession of studies and development of new attitudes toward, and new interests in, experience. This is because not all instincts of an individual begin to surface at the same time (like puberty), and to confront an individual with hidden instincts is not very productive. The development of new attitudes toward the same concept not only reinforces the image of the concept already built into the child's repertoire of experiences, but also enlarges it and connects it with new experiences. The updated concept has a larger time span of retention and persists as culturally acquired knowledge.

Education is acquiring habits, and once these have been acquired they can be hardly noticed. We, and small children in particular, have an amazing plasticity or ability to learn from experience: The power to develop dispositions; 'the capacity to retain and carry over from prior experience factors which modify subsequent activities'.[21] We have, in other words, the capacity to acquire habits and thus there is no better method than education to affect our adjustment and the environment around us. Education is developing, continually reorganizing, reconstructing, transforming, supplying the conditions which influence growth, and the difference between a normal child and an adult is that their modes of growth are different. The realization that life is growth and that one grows through education has an enormous implication for the Vesuvius area; this means that the lives of Vesuvians can be transformed through a proper education from passive to active, from resignation to participation, from negative habits to positive and constructive dispositions. Habits give control over the environment, power to utilize it for human purposes, power to apply capacities to new aims. And the value of education is the extent to which it creates a desire for growth and maintains this desire active.

2.3. KINDS OF UNDERSTANDINGS

2.3.1. The beginnings

About 5 million years ago the Hominid line (*Australopithecus afarensis*) and chimpanzee line split from a common ancestor. This proto-human had an erect posture, shared food, division of labor, nuclear family structure, and large number of children.[22] The culture of *afarensis* appears to have been episodic in the sense that this species remembered specifics of an experience: The place, the weather, the colors, the voices of the past. By definition, episodes are bound in time and space to specific dates and places, and typical examples of episodic memory are death in the family and first love. About 2 million years ago a new genus *Homo* with a larger brain appeared. This species manufactured crude stone-cutting tools and was still confined to narrow geographical locations. The next species *Homo erectus* changed, however, this situation dramatically. It appeared about 1.5 million years ago, had a much larger brain, more elaborate tools, used fire and shelter, and migrated out of

Africa and spread over the entire Eurasian landmass. *Homo erectus* was much more human in appearance, lived in an environment where social cooperation was central to species' survival, and its systematic tool technology, cooperation in seasonal hunting, cooking food, and migration to over long distances suggests that its intellect required inventing and remembering complex set of procedures and social skills that went beyond the time-bound episodic mentality. The last stage of brain growth came with the arrival of *Homo sapiens*, about 200 000 to 100 000 years ago. With the new species a new cognitive capacity of language was introduced and with it the possibility of rapid cultural advance.[23]

Humans first adapt to a language from mimetic skills or mimesis. '[M]imesis rests on the ability to produce conscious, self-initiated, representational acts that are intentional but not linguistic'.[24] This is different from imitation and mimicry which many animals possess. Mimesis can be used for rehearsing, refining a skill, performing a ritual dance, imitating an action, sharing knowledge, comprehending complex events and remembering rules, customs, behavior, and so on. Children mime adults in mannerisms, posture, and gesture, while the adults use the mimetic capacity for manual signals, facial expressions, rhythm, and so on. Mimesis is the basic medium of human communication and its vestiges can be found in the arts, plays with little or no dialogues, Chinese and Indian dance, Greek and Roman mime, and many other forms trace their origin back to prehistory. All higher mammals possess mimetic skills and social knowledge, and this is a survival strategy that *Homo erectus* used for a million years or so before domesticating fire. This is because mimesis does not involve the invention of an arbitrary set of symbols on which symbolic languages are based. Language appeared once the vocal apparatus developed late in human evolution and coincides with rapid cultural innovation,[25] leading to Neolithic culture and eventually to the one that we know today.

2.3.2. Mythic understanding

The modern humans or *Cro-Magnons* or *Homo sapiens sapiens* date to between 45 000 and 35 000 years when they replaced the Neanderthals in Europe who were advanced in cognitive skills, but apparently less adaptable than modern humans. By 35 000 years the humans had broken away from the mimetic culture and possessed elaborate spoken languages, wove fabric and sewed garments, had highly developed tribal structures, performed ritual performances, invented myths and religion.[26] Words changed everything and a semiotic culture on myth and religion was born from the mimetic culture. Myths of creation and death were the first tribal stories that connected them with their origins and world structure, and even today, among the aboriginal and other cultures, myth and religion permeate every activity of their lives. 'The myth is the prototypal, fundamental, integrative mind tool. It tries to integrate a variety of events in a temporal and causal framework. It is inherently a modeling device, whose *primary* level of representation is thematic'.[27] A symbol is a mind tool as this is invented to facilitate a cognitive operation.[28] Once the symbolic devices, particularly the lexicon, were invented this triggered mythic invention

through which the events could be mentally restructured, interrelated, and reshaped in the mind.[29]

Before language develops we have a pre-linguistic understanding with some mythic understanding built into our genes. We begin to perceive the world through our eyes, hands, and gestures, and the degree of mastery of these tools and acquisition of new ones keeps increasing as we develop and interact with the environment around us. As we grow and become exposed to adults around us, we begin to depend less and less on our genetic help and more and more on learning by producing new relations with the environment in addition to the organization of our behavior. We do this through the use of speech which becomes both a tool to solve the problems and a means to develop our mental capabilities. In the early stage of our development, speech accompanies our actions and its signs begin to internalize our problem-solving capacity and social conditions of our environment. 'The sign acts as an instrument of psychological activity in a manner analogous to the role of a tool in labor'.[30] Both tools and signs share the same mediating activity, but they diverge from each other because the tools are externally oriented for mastering and triumphing over nature while the signs are internally oriented for mastering oneself.[31] Through signs, the children are able to internalize the adaptive social means from the society at large. 'Every function in the child's cultural development appears twice, on two levels. First, on the social level, and later on the psychological level; first, *between* people as an *interpsychological* category, and then inside the child, as an *intrapsychological* category. This applies equally to voluntary attention, to logical memory and to the formation of concepts. The actual relations between human individuals underlie all the higher functions'.[32]

An essential aspect of development is the increasing ability of children to control and direct their own behavior, and at a later age integrate socially elaborated symbols (such as social values and beliefs, the cumulative knowledge of their culture, scientific concepts and reality) into their own consciousness. Vygotsky places the beginning of human understanding at the age of 3. 'Imagination is a new psychological process for the child; it is not present in the consciousness of the very young child, is totally absent in animals, and represents a specifically human form of conscious activity. Like all functions of consciousness, it originally arises from action'[33] and leads to the acquisition of mythic understanding. This understanding is typically predominant from the ages of 2 and 3 until about 6 and 8, during the time when the grammatical language develops.[34] Mythic understanding is a direct consequence of language development and can be found in oral cultures and in the discourse of young children in modern literate cultures. Some of the characteristic features of this understanding are binary opposites, fantasy, metaphor, rhythm, images, and story telling, to name a few.

The binary opposites of good/bad, hot/cold, black/white, man/female, love/hate, happy/sad, poor/rich, big/little, and so on prominently occur in myths and model thinking, because the brain is apparently wired for such discriminations. In the Chinese culture *yin* conveys the idea of coldness, clouds, rain, anything feminine, what is inside and dark, and so on; while *yang* conveys the opposite idea of warmth, a clear sky, sunshine, anything masculine, what is outside and bright, and

so on.[35] The opposites are intrinsic to human thought and are prominent in young children's thinking. Once an opposition is established and its principle understood, then either its opposite or intermediate term can be readily grasped.[36] The children can thus easily grasp something that is colder and hotter, larger and smaller, wetter and dryer, or softer and harder from their bodies which are the 'mediators' of meaning. Using the binary opposites one can teach a variety of subjects to the children, and in our situation the volcano and its surroundings as we will see below. As Nietzsche argued, the world is not structured in binary terms, but our initial grasp of it can be efficiently expressed in such terms.[37]

Fantasy is another characteristic of mythic understanding and apparently all young children delight in fantasy stories.[38] This may be because fantasies have much in common with myth stories which are structured on binary opposites. Fantasies do not conform to everyday experiences and thus provide a certain curiosity for acquiring new experiences, or simply because the adults telling the stories become themselves passionately involved with the audience. Metaphor, on the other hand, involves talking about something in terms derived from something different. '[O]rdinary words convey only what we know already; it is from metaphor that we can best get hold of something fresh'.[39] As the child's mind constantly constructs and reconstructs concepts, the metaphors are an important tool in productive learning since it enables him to see the world in multiple perspectives. Oral cultures have combated the loss of traditions by putting their knowledge into rhythmic and narrative forms. The creation myths of Babylonians *Enuma Elish*, Indians *Rig-Veda*, Chinese *P'an Ku*, Mayan *Popol Vuh*, Greek *Theogony* of Hesiod and Homer's *Iliad* and *Odyssey*, to name a few, were recited orally for hundreds of years in these cultures and taught the languages and customs of early civilizations.[40] Words evoke images in the minds of hearers and these can have a powerful emotional effect. This is especially true in the case of children who have a vivid imagination and in whom certain words or kinds of narratives can generate precise emotional states that can be exploited in learning.

Mythic understanding is important for obtaining an initial grasp of the world in young children and we need to structure a curriculum in elementary schools that takes advantage of this understanding. We can teach a variety of subject matter and cultural contexts to the young by simply taking advantage of binary opposites, fantasy, metaphor, rhythm and narrative in story telling, and a number of other capacities associated with language development. Using the opposites, Vesuvius can be described to the very young in terms of the active and passive nature of a fiery place where from time to time the hot and cold products menace the people. Using fantasy, Vesuvius and its surrounding may be transformed into fairy tales of menacing kingdoms, with the forces of hate and anger descending on a peaceful society. Words are a sharer of our knowledge and it is thus essential to ensure that the children learn fluid and flexible language in order to express their unique perceptions and consciousness, effectively communicate with others, and employ language as an extension and enlargement of their experiences.[41]

Learning and development are interrelated from the child's first day of life. The child begins to assimilate the names of objects in his environment and learns speech

by imitating the adults and being instructed how to act. The school learning introduces the assimilation of fundamental scientific knowledge and two dimensions of development: The actual development which is determined by independent problem-solving and the potential development which is determined through problem-solving under adult guidance. The difference between these two developments is the *zone of proximal development* which 'furnishes psychologists and educators a tool through which the internal course of development can be understood. By using this method we can take account of not only the cycles of maturation processes that have already been completed, but also those processes that are currently in a state of formation, that are just beginning to mature and develop'.[42] Teaching stimulates in a child internal development processes and the school must make every effort to move children in that direction, for 'the only good learning is that which is in advance of development'.[43] A mere exposure of students to new material is not effective, unless this awakens the students' consciousness or clarifies the zone of proximal development.[44]

2.3.3. Romantic understanding

Between the ages of 5 and 10 the children's understanding becomes more reliable. They typically cease to believe in ghosts and magic lands and begin adapting to the adult's more prosaic world and abstract things. The young children's mental structure of the world represented with the aid of myths begins to be replaced with a new form of reality of this world. This reality is romance and the limits of this reality deal with extreme experience, the greatest achievements, the most amazing events, the greatest heroes, the amazing battles, the wonders of the world: Something like the information contained in *The Guinness Book of Records*. The *Histories* of Herodotos[45] is filled with stories of the brave and noble, exotic and bizarre, huge projects, daring escapades and cruel stories; in short it is the sixth century B.C. equivalent of modern soap-opera magazines and television productions for the mass market. The European Romanticism is also notorious for its preoccupation with what is mysterious, remote, inaccessible, exotic, daring, and dangerous, and in passing we can mention such adventure stories of Marco Polo, King Arthur and his nights of the round table, and *Tirant Lo Blanc*. The children aged between about 8 and 15 are obsessed with these romantic stories, and with hobbies of collecting, organizing, and enlarging everything around them.[46]

The romantic understanding suggests that the students' curriculum can be defined in terms of extremes of realities and the limits of experiences, rather than on their own involvements. Through this method the students learn the limits of realities and extremes of experiences, and just about any subject matter can be presented to the students in this manner. Their actual development can be brought closer and faster to their potential development, and thus the learning can achieve the maximum efficiency of their cognitive capacity. In a sense, the romantic understanding associates transcendent human qualities; it 'is constructed by seeing the object of study in the context of someone's or some people's thoughts, intentions, hopes, or fears'.[47] When we take advantage of other people's adventures, attributes, hardships,

or virtues we connect their world with ours and bring about a humanistic side to the acquisition of knowledge. Herodotos' desire was not only to represent reality as best as he could, but also to tell a good story and to affect the emotions of his readers.

A viable approach of understanding Vesuvius and its eruptions for the age group between 8 and 15 can be developed by associating the volcano with the man's efforts to escape from the danger of earthquakes and lava flows, persistence of humans to rebuild after the terrible and devastating eruptions, stories of the rediscoveries of Herculaneum and Pompeii (Fig. 2.2) after being buried for 16 centuries by the products of the eruption of 79 A.D., Hamilton's daring confrontation with the volcano during its eruptions in late 1700s, voyages of European nobles during the Age of Enlightenment to educate themselves about the products of this age and participation in Grand Tour of Europe and Vesuvius.[48] These are lively romantic stories which not only teach history, geography, archeology, geology, art, and science, but also imprint upon the students a powerful role that Vesuvius has played in shaping the Western culture.

Romantic understanding is lively, energetic, and less concerned with systematic structures or connections among the bits and pieces and parts of the real world. It gradually leads students from the 'romantic' reality into the discovery of autonomous reality where the students' perception of the world around them becomes more real. The teens still have trouble piecing together the puzzle and producing one complex system that characterizes the real world. To achieve this level of understanding the teacher must guide the students to the next potential level of development which is associated with philosophic understanding.

2.3.4. Philosophic understanding

The students' consciousness of the external world increases with age as they internalize more and more signs from their social environment. This internalization of the processes of knowing and capacity to externalize the internal knowledge distinguishes humans from animals. Just as new tools of labor give rise to new social structures, new tools of thinking give rise to new mental structures. Both social and mental structures have historical roots and are the products of certain levels of tool development.[49] After the age of about 15 the children are capable of developing a new kind of understanding. This level of consciousness is shaped by sophisticated language and literacy and particular kind of communication that combine to develop a systematic theoretic thinking and belief that truth can only be discovered in terms of this thinking. The roots of this philosophy go back to Plato and Aristotle, and its style grew during the European Renaissance. It reached a sophistication during the Age of Enlightenment in sixteenth and seventeenth centuries when the Scientific Revolution began to take hold and has been developing ever since and producing what we now call the modern world.

For the philosophic mind, the bright bits and pieces of Romanticism form connections among things and these connections are governed by theories and laws of all kinds. The student wants to know the causes and processes leading to the effects, rather than the effects themselves. The question is not anymore what happens, but

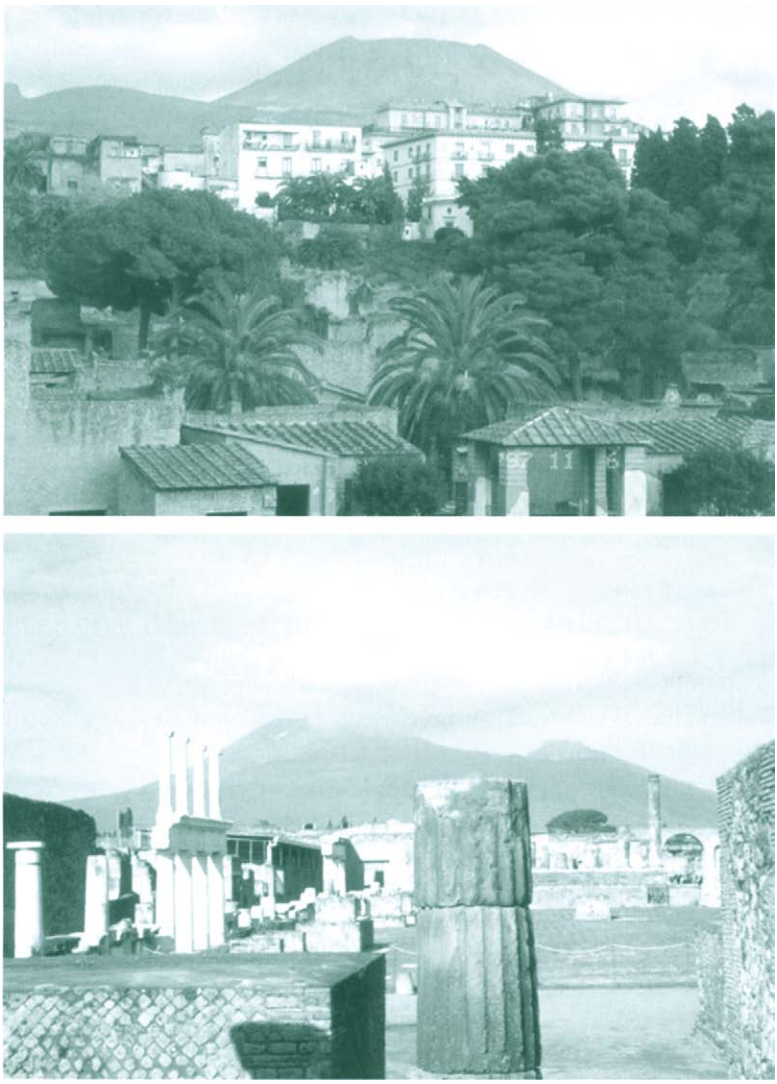

Fig. 2.2. Top: Ruins of Herculaneum in the foreground and modern city of Ercolano and Vesuvius in the background. Bottom: View of Vesuvius (to the left) and Monte Somma relief (to the right) from the forum of the ruins of Pompeii. Colour version (see colour plate section in the Prelims).

how it happens and what causes it to happen. This is not easy to answer, for it requires the acquisition of new signs and linguistic tools and reevaluation and reorganization of the old romantic concepts stored in the mind. The systematic development of philosophic understanding reaches only that small portion of the population which interacts with communities that support this kind of thinking. These are normally Ivy League schools and universities where the entering students have adequately acquired mythic and romantic capacities.[50]

The students of roughly age 15 begin to grasp that the romantic choices and associations come from social interactions, history, geography, psychology, laws of nature, and so on. They begin to understand that the heroes of Herodotos' *Histories* exchanged goods, technology, history, customs, languages, and that this bridged closer the East and the West, and forever changed the course of humanity. They begin to understand that Thucydides' *Peloponnesian War* (431–404 B.C.)[51] between Athens and Sparta is more than a romantic history; that this is a dispassionate and carefully researched (scientific) account of a terrible war which left both powers weakened and the Athenian democracy in shambles, that the war is a tragedy, a disease, and that by tracing this disease we can prevent the history from repeating itself. From this account the students also learn that the glory of Greece is the glory of Athens, not of Sparta, that Pericles' funeral oration is one of the noblest political discourses ever made, that the Athenians of the fifth century B.C. were facing the same dilemma as the democracies of our era face today. The Ionian and mainland Greeks of sixth to fourth centuries B.C. of the Golden Age of Greece and those of third to first centuries B.C. of the Hellenistic world have through their systematic inquires of the world set the stage for the philosophic point of view – a view that is privileged and unique in the search for truth.

The continuation of the search for knowledge continued in our common era via the Arabic detour after the chaos left behind by the fall of the Roman Empire in the sixth century.[52] But by 1000 new forces were at work in the West which paved the way for a spectacular period of growth where man once again began to rely on his humanistic qualities. Prior to this time, the educational activity was largely confined to monastic schools and touched only a narrow segment of the population, but during the eleventh and twelfth centuries the educational system underwent a significant expansion and change in character. Latin was the language of the learned and initially was taught in cathedral and municipal schools. The influx of new knowledge from the Greek and Moslem worlds also created a significant need for more teachers and learners, leading ultimately to the formation of the university.[53]

The Latin world of theologians, lawyers, scientists, poets, and historians left, however, little imprint on the lives of most people who did not know Latin but had to rely on the vernacular literature written in languages which they spoke daily. Foremost among the authors of vernacular literature was Dante Alighieri (1265–1321), whose *Divine Comedy*, written in the native Tuscan dialect, shows his deep understanding of human nature, its weaknesses, and aspirations. However, it was the visual arts the primary media of communication to all, rich and poor, literate and illiterate. Initially Romanesque and later Gothic architectural styles and Church decorations further extended the quest of masses for truth beyond the human existence.[54] After 1300 the intellectuals began questioning the medieval religious establishment and thus giving rise to *humanism* or prominence of human life in a materialistic world. This produced a new elite segment engaged in capitalistic ventures (like Medici in Italy), population growth, and novel technological advances leading to the European expansion overseas.[55] The dawn of the seventeenth century saw the aristocracy as being socially dominant, centralized governments headed by kings, and religious faith being of great importance to most

people. Most people were, however, relatively poor and uninformed of the latest cultural developments[56] and of the premises of the Scientific Revolution.

The Scientific Revolution in the sixteenth century started with the Polish clergyman Nicholas Copernicus (1473–1543) whose interest in astronomy, astrology, mathematics, and Church law led him to examine the Platonic and Pythagorean thought that differed from the prevailing and cumbersome Aristotelian–Ptolemaic visions of the Universe where Earth was the center of attention. Copernicus sought a simpler explanation for the motion of heavenly bodies and became convinced that Earth was not the center of the Universe, but rather that Sun was the center. His Sun-centered or heliocentric Universe, as opposed to the Earth-centered or geocentric Universe, was condemned by both the Catholic and Protestant orders as illogical and contrary to the Christian faith. Nevertheless, his idea caught on with Tycho Brahe (1546–1601) who persuaded his Danish King to supply him with an astronomical laboratory to perform accurate measurement of the Heavens, leading to the conclusion that Sun is stationary and that other planets move around it. It was, however, Brache's assistant, Johannes Kepler (1571–1630), who vindicated the heliocentric theory and formulated his famous three laws of planetary motion: First, the planets move in elliptic orbits around the Sun; second, the planets' velocities vary with the distance from the Sun; and third, there is a precise mathematical relationship between the moving planets.[57]

Kepler's discoveries paved the way for Galileo and Newton. Galileo Galilei (1564–1642) also believed in the heliocentric system, but went a step further by investigating the motions of bodies experimentally. He showed that bodies once set in motion tend to remain in motion and described the speed of falling bodies mathematically. Galileo masterfully defended the heliocentric theory in his *Dialogue on the Two Chief Systems of the World*[58] for which he was condemned by the inquisition and forced to recant. The works of Copernicus, Brahe, Kepler, and Galileo were finally synthesized by Isaac Newton (1642–1727) in his three laws of motion involving the fundamental concepts of mass, acceleration, inertia, and action/reaction. Newton also employed calculus to explain his discovery which was published in 1687 in *Principia* (*The Mathematical Principles of Natural Knowledge*).[59] The triumph of Newton's discovery lies in its simplicity: Every particle of matter in the Universe attracts every other particle with a force which varies inversely with the square of the distance between them and is directly proportional to the product of their masses. Unlike Copernicus and Galileo, Newton was widely praised during his lifetime, largely because of the groundwork of his predecessors who made science a more acceptable discipline.

The Scientific Revolution is based on experimentation, reasoning based on observed facts, and translation of this reasoning into mathematical laws. Among the foremost advocates of this new philosophy were Francis Bacon (1561–1628) and René Descartes (1596–1650). Bacon argued that the scientific conclusions could be reached through inductive reasoning using the data, whereas René Descartes' deductive reasoning of removing all assumptions about knowledge challenged everything, from the existence of God to the reality of physical world. The methods of Scientific Revolution were also extended to new fields, such as to the political theory

of Thomas Hobbes (1588–1679) and John Locke (1632–1704).[60] Thus, at the beginning of the eighteenth century the Aristotelian–Ptolemaic world of the Universe was replaced with the Copernican–Newtonian world view where only a very small segment of the society knew about it. The masses remained outside of these discoveries until the Enlightenment began to spread the ideas to the middle classes.

The Enlightenment or Age of Reason is associated with the eighteenth century where a new wave of intellectuals from the Western Europe began popularizing the ideas of Scientific Revolution. These intellectuals speculated on everything: Philosophy, science, politics, religion, economics, ethics, societal issues. Their thought first spread among the urban aristocracy and middle classes. Enlightenment thinkers believed that the nature is ordered and governed by unchangeable laws, that all assumptions should be subjected to critical reasoning, that a change should be viewed positively for it constitutes progress of humanity. In France these intellectuals came to be known as the *philosophes*. Philosophes were not formally trained as philosophers, but were sufficiently literate to spread the ideas of others in the form of plays, novels, satires, encyclopedia entries, guides, or through verbal exchanges at numerous gatherings sponsored by the patrons of Enlightenment in Paris, London, and other cities of Western Europe. Newton's synthesis (that reason and nature are compatible) and Locke's empiricism, psychology, and politics (that humans become what they become by sense of perception and reason) greatly appealed to the *philosophes*. Locke's plea for natural rights of human beings (life, liberty, property) and Baron de Montesquieu's (1689–1755) theory that the power and function of government should be equally divided between the king (executive), lords (judicial), and commons (legislative) form the foundations of some of our modern states. Probably the most influential of these intellectuals was Voltaire (1694–1778) whose 90-volume works of poetry, history, letters, essays, drama, and scientific treatises place him in the forefront of the most active of *philosophes*.[61] Some other thinkers of the age were Adam Smith (1723–1790) who theorized that the economics, like the physical world, also has its natural laws, the most basic of which is supply and demand, and Jean Jacques Rousseau (1712–1778) who challenged the contradictions within the Enlightenment itself.[62] Many writings of *philosophes* were, of course, in conflict with the religion, both Catholic and Protestant, and banned in France and Italy, but not for very long because of the rapid spread of ideas. The *Encyclopèdie* of Denis Diderot (1713–1774) and Rond d'Alembert (1717–1783) perhaps best summarizes the importance of the works of these dedicated crusaders who laid the intellectual foundation of our modern society.[63]

When philosophic understanding dominates the mind it challenges the very foundations of our perceived reality and brings us ever deeper into reflecting who we are, where did we come from, where are we going and why, what can we do to avoid making the same mistakes. These are powerful notions which extend our horizons and build minds that are capable to produce new human vistas. In students, the philosophic understanding provokes not only an interest in the world and how it functions, but also what the discoveries will reveal about themselves. The students thus become interested into a variety of subject matter: History, geography, science, psychology, economics, anthropology, sociology, ethnology, and so on. In the

hands of motivated teachers these subjects produce well-rounded individuals who are capable to view the problems from a multidisciplinary perspective. The students see themselves as parts of complex processes where establishing the truth of these processes leads to the discovery of the truth about themselves. This kind of perspective and search for truth is required when confronting the Vesuvius problem.

Plato, Rousseau, and others were, however, concerned with the search for general abstract ideas and cautioned that in the hands of dull and unmotivated teachers this can produce student's misery, frustration, and overconfidence.[64] Overconfidence is produced from one's lack of knowledge of details which often rend general theories incomplete. The truth of general schemes or natural laws emerges from careful observations, hypotheses, tests (observations), theories, and further refinement until no additional observations contradict the theory. Philosophic understanding in students is fuelled by general schemes and particular knowledge, for the former constantly requires the latter and the latter is constantly needed to revise the former. This, of course, implies that there is a never-ending process of optimization if one does not learn to judge when this process is sufficiently complete or the search for more truth brings about diminishing returns. Were it not for this fact, we could not have developed modern technology and would not entrust our lives to machines. From the internalization of social and cultural knowledge our minds generate patters, processes, schemes, and a host of other imaginary scenarios from where it is easy to fall into the trap of illusions. One needs to be attentive to the multidisciplinary data and see how these provide bounds and restrict one's confidence level. A poorly educated individual fails to see these bounds and is led astray by wishful thinking of his reality of truth.

2.3.5. Ironic understanding

Irony is 'a sarcastic or humorous manner of discourse in which what is literally said is meant to express its opposite'.[65] We use irony to express unreliability of words and remove our beliefs in the truth of general schemes of philosophic understanding. In this process, we can shift from one perspective notion to another and thus open up doubts about the security that is expressed in any one scheme. As long as people conceive of the world as made and ruled by God, the pain, diseases, or death can all be accepted as based on the grand design, but for those who contemplate Friedrich Nietzsche's (1844–1900) pronouncement of the death of God the natural world becomes a chance event of Charles Darwin's (1809–1882) notion of natural selection.

In the *Republic*, Thrasymachus complains that Socrates constantly deconstructs others' claim to knowledge, but offers nothing in return. 'I know nothing', says Socrates, 'for when I don't know what justice is, I'll hardly know whether it is a kind of virtue or not, or whether a person who has it is happy or unhappy'.[66] For Thrasymachus, this is simply a rhetorical ploy not to be caught in the contradiction which delights Socrates. According to Kierkegaard,[67] 'the tradition has linked the word "irony" to the existence of Socrates' and it is 'by means of irony that the subject emancipates himself from the constraint imposed upon him by the continuity of life'.[68] In order to deal with a world with multiple perspectives or meanings,

Descartes declares '*je pense, donc je suis*' (I think, therefore I am),[69] and thus tells us that thinking is the self-evident hypothesis upon which a secure knowledge base can be constructed. Here it is not our aim to enter into the details of metaphysical arguments of what the world is or what is perceived by us to be, but simply to point out that the experience of life brings forth a sort of insecurity or doubts to our capabilities and what we can accomplish.

The Enlightenment Age and the nineteenth century have brought forth an increasing rationalism because of rapid technological change, whereas the twentieth century, through the discovery of relativistic and quantum mechanics, has somewhat shattered our supremacy over nature. Ironic understanding recognizes how inflexible our minds are and how language symbols can play tricks to the world that we try to represent. It helps us understand better the truth about reality, but only if used in a reflexive manner without suppressing other forms of understandings.

2.4. EDUCATIONAL METHODS

We have come a long way from *Homo erectus*. From simple tools of necessity to survive, we internalized more and more diversified tools which have allowed us to build images, patterns, relations, connections, and groupings in our minds. We have undergone different cognitive transitions as we acquired mimetic skills, oral language, and external symbols, and in the process produced different stages of cultural development. We see no limit to this development, but must take into account that our biological brain is out of sequence with our cultural development which progresses much more faster. The mimetic culture, or pre-linguistic consciousness, has roots in our distant ancestors and is embedded in our DNA from birth, and as we begin interacting socially we adopt language to tell us how to see and know about the things around us. The language allows us an expression, but deep down we are still biological creatures, each with a distinct personality. Through social and cultural pressures we follow a process of development that transforms us from rudimentary to complex entities, and education may be viewed simply as employing the appropriate methods to fulfill that transformation. What exact educational method to use is, of course, a subject of continuing controversy, and because we have been using quite a few bad methods we have lost in acquiring greater knowledge and have wasted countless minds. A confrontation with Vesuvius requires: First, that we understand the premises and failures of different educational methods, and second, that we develop those techniques that will place the volcano and its surroundings among the urgent goals of the educational process. It is an illusion to expect from the young a change for the better unless we pave the way for this change through a clear understanding of the purpose of our guidance.

2.4.1. Old methods

The old educational ideas of socialization, Plato, and Rousseau are inadequate when applied individually because they are mutually incompatible. Socialization aims

too much at current conventions, the Platonic philosophy tries too hard to impose on the students a reliable image of reality, while the Rousseauian natural approach is insensitive to the students' social pressures and development of intellectual skills. If we are guided by Plato, educating the mind becomes a matter of selecting the forms of knowledge, and if we are guided by Rousseau, educating the mind becomes a matter of supporting its autonomous growth. When these progressivists and traditionalists approaches are combined we can conceive of a curriculum that draws the material from educational philosophers and methods from educational psychologists. But this is an uneasy marriage, for in the Platonic view knowledge drives development, and in the Rousseauian view development drives knowledge.

If our conception of education has only three main components, each one by itself inadequate and incompatible with other two, does this mean that our schools fail to provide the students with adequate education? We hope not and like to believe that the schools achieve a balance among the three aims. Schools provide an exposure to academic material to all students, allow for the students to excel, they socialize all students in some basic ways, and provide special help to those who need it. Socialization strives to homogenize, individual development strives to bring forth the uniqueness of each person, and the school administrators like to see a 'balanced teaching' which accommodates as far as possible different styles of learning and exposes the students to different teachers.

2.4.2. Progressivism

Progressivism came into prominence during the second part of the nineteenth century when the second Industrial Revolution required a labor force capable of supplying many skilled laborers. This was an age when the faith in machines saw an unbounded social progress of humanity and when mass education was required to support this progress. As the foremost progressivist of this period, Herbert Spencer (1829–1903)[70] advocated a set of educational principles whereby to educate children effectively it is vital to account for the nature of the child, and particularly to their modes of learning and stages of development. There must be a regular and orderly progression from what is familiar to what is slightly unfamiliar, 'by slow degrees to impressions most nearly allied'.[71] This principle is accepted even today by most teachers, if only one could start the process of learning in this manner and accept that the children can only learn those things which are closely related to those that they are already familiar with. This would clearly exclude many stories with faraway galaxies, magic with weird characters, advanced civilizations, and technological gimmicks. The fact is that the children can indeed imagine novelties such as these as long as they are associated with binary opposites, fantasy, or metaphor for young children; extremities of real situations for teens; and possibilities of connections with reality for older students. We can indeed start with what the children can imagine.[72]

Spencer and some of his followers also believed in recapitulation, or that the mode of education of mankind must begin by studying its cultural achievements in a historical manner. This, however, has not appealed to those who saw that the new progress requires skilled labor force of today instead of individuals with the

knowledge of the past. The students, they argue, may never get to the present in their studies and thus become socially useless creatures. For progressivists, the mind is central in education and the psychologist should expose the students' nature.[19] One should produce school curricula which promote students' effortless learning because this produces pleasure. The children can learn only simple and local knowledge and the subjects which test their imagination and make them think must be swept away. What is important is the utilitarian knowledge.

In the twentieth century, the application of progressivism has resulted in children being taught with less and less hard-core subjects in the early years of their schooling and becoming more and more problematic to the teachers in their later years when they must absorb not only a significant baggage of past cultural achievements, but also an unprecedented amount of new technological knowledge. The progressivists have taken Rousseau's somewhat romantic notion of education and enforced it with the authority of science. But there is a problem, for '[t]he flaw in progressivism is the belief that we can disclose the nature of the child'.[73] According to Vygotsky, education has to consider the mind as being both the psychological and social organ whereby the society mediates the child's understanding of the real world.[32] The science has been found to be extremely useful in dealing with non-biological systems and little receptive when dealing with living ones.

2.4.3. Vygotsky's method

According to Lev Vygotsky (1896–1934), the development in the child does not occur because of the accumulation of knowledge, but because of the nature of cognitive tools (the forms of mediation) that are available in the culture into which the child is born. Language is such a distinctive tool system and its signs restructure the whole psychological process. The mind reaches its potential realization in social contexts and these contexts are crucial to the processes that lead to such a potential. This is clearly inconsistent with the progressivists' view of recapitulation where education should be a repetition of civilization in little. What exactly is to be recapitulated is far from clear, given that the student also needs to learn things of the current culture in order to become a useful individual to the society.

Literacy involves a complex set of abilities to understand and use the symbols of a culture for both personal and community development. With literacy we begin to focus on what we call reality, and to engage the students toward that reality we cannot only begin with what they already know, with what is familiar in their environment, but also with what is unknown, what is engaging and deals with some extreme situations of this unknown, or what is imaginable. The student has an imagination and we need to tap into it to keep him engaged. Information can become engaging if it can be given a 'human interest' angle; if human emotions, hopes, or fears can be structured into the story itself. Knowledge is in our minds and the task of education is to convert or transmute the symbolic codes of books and other media into the students' minds. Knowledge, according to Vygotsky, serves two purposes: To mediate human activity and mediate the development of higher psychological processes by acquiring the potential understanding at every

step of students' development.[74] Vygotsky is the foremost promoter of the concept that a close connection of imagination with thinking in concepts during adolescence fulfills the same function that an artistic work fulfills for the adult. Both the child and the artist associate the virtues of the imagination and thus feel more confident, self-reliant, powerful, or whatever transcendent quality this imagination embodies.[75] Literacy develops certain characteristic ways or tools of engaging and being engaged by the world of experience, in a similar way that the tools of labor act on external objects to shape and produce new products for the society.

An effective image is crucial in communication and thus in education. 'The images that seem to have most power are those we generate ourselves from words',[76] and when they are produced we can grasp a variety of subjects ranging from mathematics, to physics, to history, and so on. Concepts and images are inseparable, Vygotsky warns us. 'A real concept is an image of an objective thing and its complexity. Only when we recognize the thing in all its connection and relation, only when this diversity is synthesized in a word, in an integral image through the multitude of determinations, do we develop a concept'.[77]

2.4.4. Primary school education

Teaching elementary or primary school children can be accomplished by employing the characteristics of mythic understanding. As we noted earlier, these characteristics include binary opposites, images generated from words, metaphors, rhythms, and so on. Any story that includes these elements taps into the cognitive capacity of young children and is able to connect this capacity with the external world. Many stories from different cultures, some fantastic and some accurate, refer to the past and help to acquire past cultural heritage and introduce the children toward more advanced forms of romantic, philosophic, and ironic understanding. These two principles should be built into the curriculum for young children.[78]

Stories of the past can include the struggle of life against extinction, which brings about history of our species, geography of our continents, plate tectonics of Earth, biodiversity of our planet, evolution of life on Earth, etc. Other stories can include history with struggles between good and evil (Greek democracy against Persian despotism), dangerous against benign nature (fuming hot and desolate mountain versus cold, green, and full of life forest and sea), small and large versus young and old (as in grouping children and adults), slavery and freedom (Spartacus against Roman tyranny, Gandhi against British occupation). What is essential is that the stories make sense of the world and of the society into which the children are growing. History is a major tool for making experiences with our changing world.

Another and closely related tool is language and literature. These can be developed by building into the curriculum stories of great mythical and religions significance, such as the creation myths of Mesopotamian, Greek, Christian, and Mesoamerican civilizations, or the founding of Rome by the Trojan prince Aeneas and the twins Romulus and Remus. Each culture has its own stories and the most engaging are those that are told and not read. From creation myths one can be introduced to astronomy, agriculture, religion, and science. When to plant and

when to harvest requires an understanding of the relation between Earth, Moon, and Sun.[79] How to conduct the exchange of goods requires record keeping and basic algebraic operations, and how to construct the Egyptian pyramids requires geometric principles. Slowly but surely the children can be led into our cultural heritage and begin exploring its limits, its aspirations, its extremities, its boundaries.

Taping into the imaginative ability of the young enlarges their intellectual engagement that is necessary for rational ordering of things. Our biology has equipped us with a high production rate of neurons during the early childhood and thus learning becomes largely effortless during these years. Soon our neuron production rate levels off and we settle into a more laborious and slower learning process. It is thus important to take advantage of our biological gift and instead of conforming the children to the rigidity of such disciplines as science, literature, or music, we should seek instead an accommodation between the nature and these disciplines and those intellectual tools within the children that are made accessible through mythic understanding.

2.4.5. Intermediate school education

The children of this age group readily associate the characteristics of romantic understanding. These characteristics are extremes of experiences, limits of existence of natural processes, and heroic qualities of individuals. Due to the pressure placed upon the society on the children of this age group, these children readily associate with those qualities that are exhibited by the heroes who are able to confront this pressure. The achievements of these heroes can manifest themselves in wars, explorations, science, sports, cinema, history, and so on. Another characteristic of romantic understanding is the children's fascination with hobbies, collecting, organizing, classifying, or grouping. Our cultures are filled with imaginary and real heroes and stories and poetry that can stimulate the children without necessarily producing in them a disciplined understanding that is required for mature development.

A school curriculum for this age group should, therefore, provide opportunities for exhaustive explorations in whatever subject is being studied. Short- and long-term projects involving one or more children can focus on key historical battles, voyages of discovery, biodiversity in ecosystems, man-made pollution as a cause of climate change, man's confrontation with volcanoes and other natural phenomena, etc. The teacher can ask the students to exemplify particular transcendent human qualities in the worlds of cinema, sports, history, and science. Whatever produces wonder and awe, odd and strange, dangerous and mighty, courageous and brave, rich and arrogant, or poor and exploited is a legitimate topic of study and will resonate with the children's cognitive system.

The study of a particular discipline such as science should be approached from the human side by introducing the individual and how he or she struggled to conduct an experiment or piece together disparate facts into unifying wholes that we call theories and natural laws. The struggle to break away from the Aristotelian –Ptolemaic or geocentric worldview and into the Copernican or heliocentric view is

a fascinating story of wrong turns and confrontation with Christianity as exemplified by Galileo. And so is the search for objective reality through Pythagoras, Descartes, Newton, Einstein, Bohr, Heisenberg, and many others who have led the way into our modern world of automobiles, computers, satellites, cell phones, and so on. Behind every scientific discovery is a great human drama which is all too often relinquished in favor of the end result or product of scientific investigation. The teachers of intermediate schools have a tremendous opportunity to elaborate the human dimensions of scientific discoveries; to take advantage of scientists' dramas and aid the students in understanding the end results of scientific investigations in later years of their development.

Other subjects, such as literature, rhetoric, and languages, must also enter prominently into the curriculum. Literature involves strong and clear narratives, and rhetoric is an art of using language to influence the emotions of men. There is no better way of becoming aware of the language than reading serious literature and in the process struggling with new words. This requires discipline on the part of the student and can be introduced into the curriculum during frequent periods of romantic diversions. The romantic learning discipline is a pressure which ensures a transition to philosophic understanding, but, unfortunately, many of our schools are not able to produce such a transition because they insist on producing students with procedural skills, instead with knowledge. '[T]he mind and the imagination cannot do anything with knowledge that is in the library; they require knowledge to be in the memory. ... Romantic understanding can give shape to the intermediate curriculum and offer the students a world that is rich, complex, varied, and as intense and vivid as their own emotional lives'.[80]

2.4.6. Secondary school education

Philosophic understanding requires that the students grasp the significance of abstract ideas, but for many this is a problem and unnecessary skill to acquire for everyday practical life; they argue that there is no necessity to 'live in the clouds' but down on Earth. This is a dangerous misconception, because the lack of philosophic understanding leaves the individual vulnerable to simplistic ideas, and if such individuals acquire the power of public office their lack of education prevents them from making sound judgments of worthy projects for their constituencies. Both Dewey and Egan stress that education for democratic citizenship must involve more than vocational preparation, because education is not simply preparing for jobs but serving and behaving as conscious members of human race. Most individuals graduating from secondary schools lack this philosophic understanding, either because they never fully acquired the romantic cognitive tool kit or failed to acquire the philosophic one.

An abstract or philosophic thinking requires that the students assimilate the general laws of social and natural phenomena. While language and literature focus on the development of vocabulary and ideas in the form of philosophic language, the history needs to focus on increasingly particular topics in order to challenge the students and invite them to undermine general schemes. Science is the 'natural'

subject of philosophy, and what the science curriculum and teaching must do is to explain why certain objects and processes are behaving as they do and what are the underlying natural laws that explain this behavior. This is perhaps too much to expect from all secondary school students, but if they fully acquired the romantic notions of scientific discoveries through the discoverers themselves, many will not have much difficulty with the following step of understanding what exactly these discoverers discovered and in what way their discoveries are important for social and technological progress. Of particular importance in this learning process is to understand that apparently disjoint scientific discoveries often combine to produce principles, theories, and laws of general validity. As an example, the teacher can explain how Albert Einstein (1879–1955) was led to the special theory of relativity by Michelson–Morley's experiment that the velocity of light is the same regardless of the direction of Earth's motion. Another example is Alfred Wegener's (1880–1930) hypothesis of continental drift which was not accepted by the scientists for 40 years, until new data from ocean floor studies became available to support it. Useful scientific theories come through connections and often produce unexpected consequences, like pieces of a jigsaw puzzle eventually coming all together.

In a philosophic-structured secondary school curriculum, the teacher should introduce to the students key social and scientific principles which form the foundation of our modern culture. He can motivate his presentations from historical perspectives or from cultural products themselves. The teacher should also challenge the students with ideas and concepts that are totally unfamiliar to them in order to focus on their 'zone of proximal development', or engage the students in intellectual activities to the maximum of their potential.

2.5. TEACHING VESUVIUS IN SCHOOLS

In this section, we will elaborate on how to apply the educational ideas and cognitive tools to teaching Vesuvius and its surroundings. In the socializing method, the role of the teacher is to guide the students into values, skills, and knowledge of good citizens of the society. In the Platonic method, the teacher is an authority in some area and his function is to instruct and inspire students to achieve intellectual mastery of the subject being taught. In the Rousseauian method, the teacher's primary responsibility is to support each student's individual development. These three approaches weight differently in practice, depending on whether primary, intermediate, or secondary school students are being educated.

The key to education depends how effectively we accumulate the external cultural symbols as a kind of tool kit for the brain, or, according to Vygotsky, how effectively these tools in combination with imagination program our brains and produce minds with unsuspected possibilities. Our brains in effect become transformed by the cognitive tools of the external culture and it is the teacher's responsibility to develop this transformation as far as possible.

An educational strategy applied to Vesuvius should be regarded as a process whose focus of interest and intellectual engagement begins with a myth-like

construction of the volcano, then romantically establishing the boundaries and extent of reality about the volcano and its surroundings, and finally philosophically mapping the major features of the Vesuvius problem through interdisciplinary integration. We discuss below how these cognitive tools can be used to produce effective learning of students about Vesuvius and its surroundings.[81]

2.5.1. Teaching primary school children

2.5.1.1. Methodology

The mind of an infant has the beginning of mimetic understanding which has been acquired over several million years of Homo's evolutionary process and this capacity remains throughout the adult life as a sort of tool for survival. The infant begins to assimilate the environment around him through his body, hands, eyes, and ears, and it is through these qualities that his mimetic capacity keeps increasing. This capacity peaks, however, between about 2 and 4 years when the brain cell division peaks[82] and when the mimetic understanding begins to cede to mythic developments through the acquisition of language. The oral language becomes the principal means of knowledge acquisition and the teacher should use the appropriate methods or tools of this language.

Engaging the student's imagination is crucial to successive learning and the content of the story is one of the most powerful cognitive tools that we have to shape his emotional involvement. Stories can shape both real world and fictional content and should include binary opposites, rhythm, rhyme, metaphor, image, and other tools of mythic understanding. The value of the story is its power to engage the student's emotions to people, things, and events, and it is through such emotions that the individual internalizes the external culture and externalizes his imagination.

We will present below a mythic planning approach for dealing with Vesuvius, but the ideas are applicable to any topic and situation for use by the teachers when educating the children between about 4- and 8-year old. This procedure includes identification of what is important and engaging of the subject, finding binary opposites and other tools of mythic understanding to capture the affective importance of the topic, organizing content into a story, evaluation for evidence of understanding of the topic, and some examples of the procedure.

A. Identifying importance of topic

What is emotionally engaging about Vesuvius and how it evokes wonder?

The first task of the teacher is to identify what are the important features about Vesuvius by employing his or her emotional attachment to the volcano. This can be a sense of wonder, fear, desperation, or other qualities; anything that will bring about some emotional response. If the teacher is not used to think in these terms, this approach will produce some difficulty and will require practicing.

First of all, Vesuvius is a mountain that is different from other environments (sea and open fields) and from other mountains, as one can see from the school's playground or when walking to school.[83] Vesuvius is different from other

mountains because of its shape and what is inside it. The teacher should explore different shapes with models (cubes, balls, cones, pyramids) and come to the conclusion that this mountain has the form of a cone. As to what is inside this mountain (we don't know yet that it is a volcano) the teacher can first explain something about the rocks (Earth's crust and mountains are made of rocks) and their differences (igneous and metamorphic), and what is very important the concept of heat. The children should understand this concept (Example 1 below) before being introduced to Vesuvius. Vesuvius is about 1100 m high, which is the length of about 1000 small children when holding their hands in stretched positions. Its most important characteristic is that it can emit very hot rocks and gas and that these can put the people in danger. When these rocks come out from Vesuvius people may have to escape from their homes and can return only when it is safe again. Sometimes the people's houses are destroyed and they have to be rebuilt. Another of Vesuvius' characteristics is that it has little vegetation and few animals on its upper slopes, because there one cannot live, plant flowers, or grow plants. Only its lower slopes contain fertile soil that is rich in minerals and thus suitable for growing grapes, lemons, oranges, and plenty of vegetables. The fertility of the land surrounding Vesuvius and good climate close to the sea are the principal reasons why the ancient Greeks settled into this area and decided to stay around and build beautiful cities like Ercolano, Pompei, and Stabia.[84]

B. Finding affective ingredients of story

How to shape the content for emotional meaning and engage imagination?

A good story, whether real world or fictional, has drama and affects people's emotions. In the case of Vesuvius, we need to capture the emotions in a story with mythic cognitive tools of binary opposites, rhythm, or other tools noted earlier. Some of these elements are large/small (the mountain is at least 1000 times higher than an average student in the class); hot/cold (inside Vesuvius there are very hot rocks which one cannot touch without suffering pain and gas that one cannot breathe); dangerous/benign (when hot rocks in the form of a river come out from Vesuvius they can put people, animals, and property in jeopardy and one must follow instructions from teachers or parents what to do to avoid the danger); noisy/tranquil (Vesuvius makes noise and shakes the ground, like being in a boat on a stormy sea, before emitting molten rocks and gas); good/bad (the mountain produces bad land when it erupts ash and hot molten rocks and gas, but as these materials cool they produce a soil that is rich in minerals and suitable for planting fruits and vegetables).

The teacher can ask the students to describe what kind of images these tools evoke. Images play a crucial role in memorization and are used in ancient and modern myths to stimulate psychological effects.

C. Organizing content into story

How to tell a story with content?

The story must be a narrative that begins with a problem or conflict, is elaborated in the middle, and is concluded with some resolution of the problem.

It must also be self-contained as much as possible and end before the teacher dismisses the students. As examples, we can build stories how Vesuvius buried Pompeii and Herculaneum in 79 A.D., Torre del Greco in 1794, or San Giuseppe Vesuviano in 1944. In these stories we have the drama of destruction by natural forces, flights of people to escape from dangerous rivers of red-hot rocks, struggles of people to cope with the consequences of eruptions, an uneasy cohabitation of people with the volcano, and so on. For preschoolers, we can even think of fictional stories of how a mean prince residing on the mountain doesn't like the peace loving and good people below the mountain and from time to time expresses his anger by sending down the hill red-hot rocks and gas to scare the inhabitants. This anger can also be earthquakes, ash fall from the sky, or large waves on the sea that destroy boats. The flights of people can involve gathering family members, following instructions of parents and teachers, looking at different ways to escape from the danger (land or sea, on foot or with a car), and so on. As to the consequences of eruptions, we can build stories how one can protect oneself from lava or molten rocks coming down from the mountain or ash falling from the sky.

In the story telling, we should not include everything of relevance to the topic, but only that relevance that is determined by the cognitive tools of binary opposites, rhythm, rhyme, metaphor, images, or fantasy that is affective for the topic. Teachers can take the students to museums, volcanological observatory to look at different types of rocks and become familiar with instruments that measure ground motions, make the students collect objects and articles pertaining to Vesuvius, etc. The key to children's learning about the volcano is to develop stories in terms of the tools that mitigate mythic understanding.

D. Conclusion of story

How to end the story and resolve the problem or conflict?

The best way to conclude the story is to resolve the problem or conflict using the cognitive tools of mythic understanding and reveal from the story some deeper meaning which can be investigated in future stories. Binary opposites are central to the story and most important tool which allows the children to grasp the world around them. One can avoid the danger from Vesuvius when the ground shakes by hiding under the desk in the class, or when instructed by teachers run into empty spaces of school's playground. The teacher can ask the students to imagine different ways of protecting themselves when the ash falls from the sky (covering heads with pillows and mouths with wet towels). It is important that the story ends positively, that the menace from the volcano can be managed if one takes precautions and exercises prudence.[85] After all, haven't people around Vesuvius survived this menace for over 3000 years?

The students can be asked to produce sketches and models of the story. Building models of Vesuvius is a common occurrence of preschoolers and elementary school children and they are often exaggerated, which is a sign of difficulty in representing reality. Drawings and models are good ways to conclude the topic, as these can be exhibited in the school and used in competitions and external exhibitions. These and other explorations of the story and model building can introduce children to the unfamiliar world of natural phenomena and social structures and their organizations.

E. Evaluation for evidence of understanding

How to evaluate whether the topic has been understood and content learned?

One can do this by developing a checklist that records students' span of attention, intensity of involvement, deepness of understanding, ability to cooperate in group projects, and so on. The teacher can also engage the parents in mythic understanding. This may involve stories from social and material worlds, fictional stories, bedtime stories, or stories that develop images from words. Illustrated storybooks and television are not always effective in developing the children's imaginative capacity.[86]

2.5.1.2. Example 1: Heat

A. Importance of heat

Heat is important in everyday life, but it can be also very dangerous. One feels wonderfully in the summer when eating ice cream because it contains little amount of heat, and eating soup in the winter because it contains a great amount of it. One goes swimming in the summer and not in the winter because the water contains more heat in the summer than in the winter. Heat is helpful to keep us warm in the winter and for cooking food every day, but it is also dangerous when it is in the fire and when it comes down from Vesuvius in the form of a red river.

B. Affective qualities of heat

Heat has binary opposites of hot/cold and helpful/destructive. One's body is hotter than ice and colder than fire, or something is very hot or very cold when one feels pain by touching it. Today one can touch the rocks of Vesuvius without feeling pain, but when they come down the mountain in the form of a red river they are very hot and are as painful as fire on the stove or boiling water. When something is very cold it is as cold as ice cubes from the refrigerator. Heat can be helpful when used for warming ourselves and for cooking food, and dangerous when there is too much of it or when we feel pain from it.

Heat in the form of fire in Greek and Roman mythologies project vivid images and metaphors: Prometheus stealing fire from the Gods and giving it to humans and for this being punished by Zeus, Phaethon failing to drive Apolo's fiery chariot across the sky, Hephaistos the Greek (Vulcan the Roman) God of Fire using the fire in volcanoes to produce armor and weapons for men.

C. Story of fire

A story of fire based on the Greek mythology[87] can go like this.

Long before the Gods appeared there was darkness and death, and from this Love was born. Love created Light and Day and from them Earth and Heaven were born. Earth and Heaven gave birth to many monsters who had overwhelming strength of earthquakes and volcanoes; they were bad and ugly and mean and menacing. From the God Cronus (Saturn) in the Heaven Zeus (Jupiter) was born, and he with hundred-headed monsters fighting with thunder, lighting, and earthquakes, and with the help of God Prometheus, managed to conquer other Gods in the Heaven and become the supreme ruler of all other Gods.

The world was now ready for men and Prometheus created people and made them better than the animals. He then went to the Heaven, to the Sun, where he lit a torch and brought fire down to the men on Earth to protect themselves from wild animals, for keeping them warm, and for cooking food. In his anger at Prometheus for giving fire and heat to men, Zeus created a sweet and lovely thing to look at, a wonder to behold, a great beauty called Pandora (the gift of all) from whom women came about on Earth for punishing men. Zeus now turned his anger at Prometheus by torturing him, but he could not be broken from the cruelty of the God of Heaven. Eventually Zeus gave up on his anger and Prometheus, the giver of fire to men and women, was freed. The people kept their fire and lived happily ever after.

D. Conclusion of story

The story of Prometheus, the giver of fire and heat to the people on Earth, ends with the good and generous winning over the bad and mean Zeus, and with the people keeping the gift and living happily ever after.

At this point the children can be asked to list the ways in which the heat helps their lives and in what ways this may be harmful to them. They can also be asked to produce drawings of Prometheus lighting his torch and giving fire to men, or by being punished by the mean Zeus. The idea is to develop the students' imaginations and imprint upon their minds the concept of heat and fire. The children can also be introduced to the thermometer as an instrument which measures heat in the form of temperature, and shown how to use this instrument to determine how much heat they have. With the concept of heat grasped, the children can now be introduced to the danger posed by the heat from Vesuvius.

E. Evaluation for evidence of understanding

The teacher needs to know what the children have learned. This can be achieved through questioning of story's content and other related situations of heat and fire, evaluation of drawings and models, listing of three important things from their lives where heat has affected them the most, etc.

2.5.1.3. Example 2: Scuola Materna IV Circolo and Scuola Materna L. Bertelli, Portici

Annamaria and Rosaria Trotta are the schoolteachers in Portici and together with their colleagues are already preparing 3- to 6-year-old children for their responsibilities of self-confidence, authority, and initiative. The children are guided to form an imagination of the territory and thus understand some aspects of the volcano by exploring the fragility and relationship between man and nature. The teachers' principle objective is to explore, discover, and systematize the children's knowledge of the Vesuvius area.[88] An example of their method is as follows.

A. Importance and qualities of Vesuvius

The children are guided in discovering and learning the important differences between the mountainous and marine environments, and in particular about the differences between Vesuvius and other mountains.

B. Identifying stories

The children are encouraged to produce their own stories and experiences about their nearby mountain (Vesuvius) by searching magazines, newspapers, and encyclopedias, and by asking questions of the characteristics of their territory. This includes exploring the mountain from the school's playground, taking walks with teachers and parents, discovering different types of rocks, and cataloging flora and fauna living on the slopes of the volcano. The teachers prepare rough sketches of the environment and ask the children to complete them with details and produce their own designs based on their experiences and imaginations.

C. Concluding stories

Stories are concluded with drawings and models of Vesuvius and its environment, with some of these works being illustrated in Fig. 2.3. The children are also encouraged to participate at expositions, such as the one shown in the figure.[89]

D. Evaluation for evidence of understanding

The evaluation consists of closely monitoring students during the project, making the children imagine and list different characteristics of Vesuvius and its surroundings, and evaluating their drawings and models for imagination and ability to model the territory.

2.5.2. Teaching intermediate school children

2.5.2.1. Methodology

Teaching students from about 8- to 15-year old can be stimulated with the cognitive tools of romantic understanding. We recall that the characteristics of this understanding include fascination with the limits and extremes of experience and with exotic and strange features of reality. The students from this age group associate with an alien reality; with the ideas, things, people, or some other qualities that transcend their daily lives. Once the students become fluent in reading and writing they begin using literacy to stimulate a new conception of reality where someone or something seems able to overcome the threats posed by their everyday life. It is easier for these students to feel the emotion of wonder than face the features of natural world. This is an important tool that the teacher can use to stimulate the imagination; to locate something wonderful in everything that he teaches. We mentioned earlier Herodotos and pointed out that his stories are full of romantic movements.

Knowledge is the product of human beings with their emotions, passions, hopes, and fears. Routine activity stifles the imagination and the more often the teacher changes the context the more effective learning becomes. This can be achieved by making both the teacher and students the participants in the events being studied, by interrupting class lectures through field trips and visits to museums, or by assigning individual and group projects. Preparing and organizing lists of objects, classifying according to different criteria, or flowcharting the process or sequence of events, brings about the acquisition of new cognitive tool kits and knowledge into the minds.

Fig. 2.3. Drawings of Vesuvius and its environment produced by the preschool children of Scuola Materna L. Bertelli in Portici. From students' exhibition at Museo Nazionale Ferroviario di Pietrarsa, 16 December 1996, Portici. Colour version (see colour plate section in the Prelims).

A. Identifying transcendent qualities

What transcendent human qualities are central to the topic and what emotion and wonder do they evoke?

Teachers can begin planning a topic on Vesuvius by first identifying for themselves their emotional attachment to it. The qualities of this topic can be wonder, courage, fear, hope, resignation, etc. Anything that humanizes the topic shows the world in human terms and gives human meaning to events. Identifying the transcendent qualities in the topic is key for the successive stage of story planning. As an aid, the following is a brief summary of these qualities.

Vesuvius produces an amazing variety of eruptions[90], from rather benign lava flows, from which one can escape, to the very dangerous pyroclastic flows from which there is no escape if caught on their paths. When the volcano produces a plinian column, or an umbrella-like cloud, ash and ash-soaked rain fall from the sky and one can protect oneself by covering the head and mouth. When this column collapses, however, the hot gas and ash travel at an enormous speed of over 150 km/h along the ground and there is little chance to escape from this wave of doom. Due to this danger the people around Vesuvius are fearful that the authorities will not provide them with enough time to escape and have begun their own efforts in preventing this situation from happening. It takes an enormous courage to live around the volcano because of its potential for destruction. This can be seen by visiting the ruins of the ancient cities of Pompeii and Herculaneum which on 24 and 25 August in 79 A.D. were buried in some places with more than 10 m of pyroclastic debris. And what is really amazing is that most of the people were able to escape from their homes, before their cities were completely destroyed from falling ash and ground-hugging pyroclastic flows. A similar event occurring today would be much more disastrous because of many more people living around the volcano.

As the commander of the Roman fleet stationed in Miseno, Pliny displayed an uncommon courage and curiosity during the eruption of 79 A.D. by personally trying to help the people in danger. He took a boat and his men and sailed toward Vesuvius, but once there he could not escape anymore and died from asphyxiation. A similar courage was also displayed by the English Ambassador Hamilton who at the turn of the eighteenth century was so fascinated with the volcano that he often risked his life to understand the strombolian and lava flow activities very close and without any protection. On few occasions he barely escaped with his life from the fury of Vesuvius. The great German novelist and man of letters Goethe also displayed a great curiosity by observing the eruptions very closely. Through his diaries, many Europeans learned about his amazing and breathtaking experiences in the Vesuvius area.

In the 1800s, Vesuvius was a target of European nobles and naturalists who experienced the volcano up close and personally and contributed to the Age of Enlightenment. The twisting and amazing stories leading to the rediscoveries of the buried cities of Pompeii and Herculaneum[48] during this century are dramatically engaging and brought about the new sciences of volcanology and archeology, and opening of the first volcanological observatory in the world in 1847.[91]

When Vesuvius erupts people often call upon San Gennaro[4] for some of his miracles, and it is incredible that even today many people still believe that this saint will save them from the volcano. Christianity is deeply rooted with the Neapolitans and represents an unmatchable hope for most people around Vesuvius. San Gennaro is the ultimate savior and it is unfortunate that at this time he is the best hope of protecting Vesuvians from future eruptions!

Villa of the Mysteries outside of the Herculaneum Gate at Pompeii (this gate connected the city with Herculaneum) contains an intriguing set of frescoes. These frescoes depict women engaged in activities that suggest their initiation into the mysteries of the cult of Dionysus (Greek) or Bacchus (Roman) in preparing for

marriage.[92] The worship of Bacchus (the God of Fertility) is shrouded in secrecy, and the placement of the villa on the outside of city walls of Pompeii may had been intentional for the purpose of worshiping cults that were not approved by Rome. And speaking of Bacchus, we should not forget Martialis' famous epigram[93] on the eruption of 79 A.D.

Hic est pampineis viridis modo Vesbius umbris,
presserat hic madidos nobilis uva lacus:
hac iuga, quam Nysae colles plus Bacchus amavit,
hoc super Satyri monte dedere choros.
Haec Veneris sedes, Lacedaemone gratior illi,
hic locus Herculeo nomine clarus erat.
Cuncta iacent flammis et tristi mersa favilla:
nec superi vellent hoc licuisse sibi.

B. Organizing the topic into a narrative

What aspect of the topic embraces the transcendent qualities, how to organize the material into a story, what parts of the story illustrate human emotions, how to add content to the story?

We can associate transcendent qualities to Pliny the Elder aiding people in danger, Hamilton studying volcano up close and personal, people living too close to the cone of Vesuvius, great eruptions destroying the territory, courage of people to rebuild after eruptions, Bourbon leaders for making the volcano a center of cultural activity, or even to San Gennaro's capacity to mitigate the eruptions. Each of these topics has a rich cultural background from which the students can learn history, art, literature, and science. Some of these topics are elaborated in Notes 4 and 48, and in Example 1 below we will build a story around Pliny the Elder who is the first great personality that confronted Vesuvius and died in the process. This immortalized hero can lead us into the historians, politicians, and grand orators of the Roman Empire, earth science, and medieval Aristotelian dogma as perpetrated by Pliny's *Natural History*. The students can be made to investigate numerous personalities and events associated with our character and thus explore the limits of reality.

The narrative must have the beginning, a middle, and the end, with the principal characters providing drama and conflict. While it is easy to assign topics to the students, it is difficult to make them elaborate these topics without providing guidance on literature search, taking notes while studying, and modes of collaboration. This is where the teacher must step in and make aware the students about the connections between personalities and events and things seen from different perspectives. Through their work the students must feel that they exhausted the topic, that they became the authority on the subject, and that the world is understandable and not limitless.

C. Conclusion of the story

How to end the story and make the students satisfied with the wonder of the topic?

The story cannot just end; it must resolve some conflict and bring about the heroic or contrasting qualities of its protagonists. It must also make the students understand how through romantic association with the topic they can understand

other topics, how the topic leads to higher levels of philosophic and ironic understandings where the limiting and limitless are replaced with the more objective notions of reality.

D. Evaluation for evidence of understanding

How to determine whether the contents of the topic have been learned and stimulated the students' imagination to confront other topics?

Teachers should determine to what extent the topic engaged the students' imagination. They also need to determine to what extent the students can use the knowledge of the topic in other contexts. For this purpose, the students can be questioned on the heroic qualities of protagonists, their ethical and moral standards, historical consequences, or scientific implications. It is important to determine how far the students have progressed in confronting the reality and ability for engagement beyond the classroom lectures and assignments. This can be accomplished through term papers, classroom discussions and presentations, field trips, and participations at competitions and expositions.

The parents can also be encouraged to develop romantic understanding of their children through reading and family discussions, support hobbies of collecting, sorting, and cataloging of a variety of things, from plants and animals to coins, stamps, Vesuvius paraphernalia, and so on.

2.5.2.2. Example 1: Pliny the Elder and the eruption of Vesuvius in 79 A.D.

A. Identifying heroic qualities

Pliny the Elder[94] is our heroic hero of the eruption of Vesuvius in 79 A.D. At the time of the eruption on 24 August he was stationed in nearby Misenum as the commander of one of the two Roman fleets. Staying with him was his sister Plinia and her 17-year-old son Pliny the Younger. These two Plinyes will be forever attached to this eruption: Pliny the Elder because he performed a daring rescue during the eruption and died in the process, and Pliny the Younger who immortalized his uncle by describing his death in the midst of the erupting volcano.

We can associate with Pliny the Elder the transcendent qualities of extreme natural curiosity and daringness to attempt a rescue in the midst of an erupting volcano. The natural environment provides another quality which affected thousands of people in the surrounding towns. The eruption entered into the annals of science as the first ever documented event of unprecedented proportions, and the towns buried by this eruption have provided the modern times a unique opportunity to understand an ancient culture. And there is Pliny the Younger too without whom we would not know many details of this unique event in the human history. A good story should be built on these qualities, with adequate provision of content to engage students' imaginations and make them understand the destructive power of their volcano.

B. The eruption of Vesuvius in 79 A.D.

It would be foolish to speak of our hero Pliny the Elder without understanding something about the social environment where he lived and worked and the legacy that he left behind after his death. He was born into the age of troubled Roman

emperors Caligula, Claudius, and Nero, and died at the beginning of *pax romana*, or 'period of Roman history in which the happiness of a great people was the sole object of government',[95] of the emperors Vespasian, Hadrian, Antoninus Pius, and Marcus Aurelius. The Empire stretched from Britain on the north, to Spain on the west, to North Africa on the south, and Middle East and Black Sea on the east. It was a time when the Empire flourished on the slave method of production (80% of people were slaves), efficient political institutions, and brutal suppression of opposition. Latin was the language of law, administration, and business, and Greek was the language of science and philosophy. Every educated Roman had to know these languages and study rhetoric or public speaking, good manners, and general knowledge. In his *Natural History*, Pliny quotes many more Greek than Roman authors, and even if he lived in the Roman world his intellectual curiosity was shaped by the Greeks. For centuries afterwards, his encyclopedia had a tremendous influence on European scholars and it required the Scientific Revolution to break this influence.

And so by 79 A.D. Pliny had already earned a place in history without Vesuvius. But Vesuvius would be his tomb and make him immortal: He would rise from a scholar, procurator, and prefect to a hero of the most devastating and famous eruption of all time. This stage was also set by the environment around the volcano: A prosperous business town of Pompeii to the southeast and a resort town for the rich and famous of Herculaneum to the southwest of Vesuvius. These were the towns where the Greek immigrants settled after arriving into the area in the nineth century B.C.

The Greeks came from the island of Euboea and arrived at Ischia (Pithecusa, in Greek). By the sixth century B.C. they settled in Cuma (Kyme, in Greek) on the western shores of the Phlegraean Fields and Partenope on the small island of Megaride in the Bay of Naples[96] where today is situated Castel del'Ovo (castle built in the eleventh century by the Normans). The Greeks readily adapted to their new land that guaranteed abundant food supply, mild climate, strategic location, and a port of call for many Mediterranean travelers. They abandoned the desire for war and dedicated more time to leisure, music, art, dreaming, and amorous pursuits. And it was only in 474 B.C., when the Etruscans attacked Cuma, but did not succeed because the Cumaeans received help from Syracusans, that the Greeks began constructing a new fortified town on the mainland, a short distance from Partenope and at the site of today's historic center of Naples. They named this new place Neapolis (new city, in Greek) to distinguish it from Palepolis (old city, in Greek) or Partenope. Early Neapolis was not like a Greek *polis* (city state), but rather like a commercial community governed by aristocrats and people organized into political and religious organizations. Here the Greeks attempted to ignore the war-like Samnites of Campanian mountains who searched for an outlet to the sea and Romans who wanted to extend their hegemony in the south. In 421 B.C. the inland Samnites conquered Cuma and expelled its inhabitants who took refuge behind the walls of Neapolis. In 328 B.C. the Neapolitans rejected a peace treaty with the Romans, but 2 years later were forced to accept a confederation with them without losing any of the prerogatives, institutions, culture, language, or even the right to coin currency.[97]

Pompeii was founded in the eighth century B.C. on the commercial crossroads of Cuma, Naples, Nola, and Stabia, about 30 m above the sea on an ancient lava flow promontory and at a short distance from the mouth of the river Sarno (Sarnus) and the sea. Initially the city was populated by the Campanian Oscans who also gave it its name. Very little is known of these people and it was the colonizing Greeks who were the first to capture Pompeii and use it as a strategic trading post with Cuma, Pozzuoli (Puteoli), Naples, and Nocera. This success aroused the jealousy of Etruscans on the north who occupied it in the seventh century B.C., until they lost the war with Cumaeans a century later and the town passed under the Greek domination. But this would not last for very long as the Samnites from the Campanian mountains began conquering most of the territory on the plain (except Neapolis) and Pompeii passed under their jurisdiction, although it continued to remain strongly influenced by the Greeks. At this time Pompeii also began to be fortified, and after the Samnite Wars (343–290 B.C.) the Romans became the new masters of the entire Campanian region. Pompeii was also faithful to Rome during the Punic Wars, and during the second century B.C. experienced rapid growth from the trade with towns surrounding Sarno River and those of Campanian hinterland. It was also during this period that Pompeii experienced a strong influx of Roman imperial families and the city became an important commercial center and a vital port in the Vesuvius area.[98] In 90 B.C., Social War broke out between Rome and her allies that sought privileges of Roman citizenship, but Pompeii made peace and saved herself from siege engines and devastation from the Roman general Sulla. Pompeii (as well as other revolting towns) got these privileges anyway and by adopting many of the Roman customs became a very prosperous city of some 20 000 inhabitants by the first century of common era.[99]

Herculaneum was first populated by Oscans and then suffered similar colonizations (by Greeks, Etruscans, Samnites, Romans) as her sister city Pompeii.[100] By the end of the Roman Republic with the dictator Julius Caesar coming to power, Herculaneum became a fashionable resort and a playing ground for rich patrician families, such as Nonius Balbus, one-time governor of Crete and Lybia, and Calpurnius Caesonius Piso, Julius Caesar's father-in-law who built the sumptuous Villa of the Papyri at the western outskirts of Herculaneum. The Romans soon adopted many Greek customs and even Greek as their second language, and nobody paid any attention to Siculo, Strabo, Vitruvius, or the nearby smoking caverns and geysers of steam and water of Phlegraean Fields where the Romans built luxury baths (at Baiae). Herculaneum was built on a lava flow promontory, 20–30 m above the sea level and commanded a splendid view and soothing breezes. It was a paradise within a paradise. And what could go wrong, considering that nobody had any living memory of any great danger lying around?

It started on 5 February 62 A.D. when a severe earthquake of grade 9 on the Mercalli scale severely damaged Pompeii and caused many casualties.[101] The earthquake also produced a severe fire in the city and many inhabitants were dismayed and shocked. Herculaneum and Nuceria (Nocera) also suffered considerable damage. The neighboring city of Naples was also affected, and as the Roman essayist Seneca (4? B.C. – 65 A.D.) informs us this and subsequent earthquakes in the Vesuvius area

caused a massive emigration of many without returning to Campania. Seneca also notes that these earthquakes had devastating effects on some people ('some lost their minds') and on animals ('a flock of 600 sheep perished').[102] The archeological evidence in Pompeii also attests to the earthquakes before and after 62 A.D., but by 79 A.D. the inhabitants apparently became used to them and life returned to 'normal' as the people tried to rebuild the damaged city.[103] But on 24 August the peace and serenity exploded catastrophically, and so the day of infamy began.

This is vividly described by Pliny the Younger in two letters to the Roman historian Cornelius Tacitus (55–120),[104] some 17 years after the eruption. The first letter describes the glorious death of his uncle Pliny the Elder. The second letter describes the consequences of the eruption on him, his family and citizens of Miseno, and the fear and escape from this town some 30 km away from Vesuvius.[105] Pliny tells us:

'My uncle was stationed at Misenum, in active command of the fleet. On 24 August, in the early afternoon,[106] my mother drew his attention to a cloud of unusual size and appearance. He had been out in the sun, had taken a cold bath, and lunched while lying down, and was then working at his books. He called for his shoes and climbed up to a place which would give him the best view of the phenomenon. It was not clear at that distance from which mountain the cloud was rising (it was afterwards known to be Vesuvius); its general appearance can best be expressed as being like an umbrella pine, for it rose to a great height on a sort of trunk and then split off into branches, I imagine because it was thrust upwards by the first blast and then left unsupported as the pressure subsided, or else it was borne down by its own weight so that it spread out and gradually dispersed. Sometimes it looked white, sometimes blotched and dirty, according to the amount of soil and ashes it carried with it. My uncle's scholarly acumen saw at once that it was important enough for a closer inspection, and he ordered a boat to be made ready, telling me I could come with him if I wished. I replied that I preferred to go on with my studies, and as it happened he had himself given me some writing to do.

As he was leaving the house he was handed a message from Rectina,[107] wife of Tascius whose house was at the foot of the mountain, so that escape was impossible except by boat. She was terrified by the danger threatening her and implored him to rescue her from her fate. He changed his plans, and what he had begun in a spirit of inquiry he completed as a hero. He gave orders for the warships to be launched and went on board himself with the intention of bringing help to many more people besides Rectina, for this lovely stretch of coast was thickly populated. He hurried to the place which everyone else was hastily leaving, steering his course straight for the danger zone. He was entirely fearless, describing each new movement and phase of the portent to be noted down exactly as he observed them. Ashes were already falling, hotter and thicker as the ships drew near, followed by bits of pumice and blackened stones, charred and cracked by the flames: Then suddenly they were in shallow water, and the shore was blocked by the debris from the mountain. For a moment my uncle wondered whether to turn back, but when the helmsman advised this he refused, telling him that Fortune stood by the courageous and they must make for Pomponianus at Stabiae. He was cut off there by the breadth of the bay

(for the shore gradually curves round a basin filled by the sea) so that he was not as yet in danger, though it was clear that this would come nearer as it spread. Pomponianus had therefore already put his belongings on board ship, intending to escape if the contrary wind fell. This wind was of course full in my uncle's favor, and he was able to bring his ship in. He embraced his terrified friend, cheered and encouraged him, and thinking he could calm his fears by showing his own composure, gave orders that he was to be carried to the bathroom. After his bath he lay down and dined; he was quite cheerful, or at any rate he pretended he was, which was no less courageous.

Meanwhile on Mount Vesuvius broad sheets of fire and leaping flames blazed at several points, their bright glare emphasized by the darkness of night. My uncle tried to allay the fears of his companions by repeatedly declaring that these were nothing but bonfires left by the peasants in their terror, or else empty houses on fire in the districts they had abandoned. Then he went to rest and certainly slept, for as he was a stout man his breathing was rather loud and heavy and could be heard by people coming and going outside his door. By this time the courtyard giving access to his room was full of ashes mixed with pumice-stones, so that its level had risen, and if he had stayed in the room any longer he would never have got out. He was wakened, came out and joined Pomponianus and the rest of the household who had sat up all night. They debated whether to stay indoors or take their chance in the open, for the buildings were now shaking with violent shocks, and seemed to be swaying to and fro as if they were torn from their foundations. Outside on the other hand, there was the danger of falling pumice-stones, even though these were light and porous; however, after comparing the risks they chose the latter. In my uncle's case one reason outweighed the other, but for the others it was a choice of fears. As a protection against falling objects they put pillows on their heads tied down with cloths.

Elsewhere there was daylight by this time, but they were still in darkness, blacker and denser than any ordinary night, which they relieved by lighting torches and various kinds of lamp. My uncle decided to go down to the shore and investigate on the spot the possibility of any escape by sea, but he found the waves still wild and dangerous. A sheet was spread on the ground for him to lie down, and he repeatedly asked for cold water to drink. Then the flames and smell of sulfur which gave warning of the approaching fire drove the others to take flight and roused him to stand up. He stood leaning on two slaves and then suddenly collapsed, I imagine because the dense fumes choked his breathing by blocking his windpipe which was constitutionally weak and narrow and often inflamed. When daylight returned on the 26th – two days after the last day he had seen – his body was found intact and uninjured, still fully clothed and looking more like sleep than death.

After my uncle's departure I spent the rest of the day with my books, as this was my reason for staying behind. Then I took a bath, dined, and then dozed fitfully for a while. For several days past there had been earth tremors which were not particularly alarming because they are frequent in Campania: But that night the shocks were so violent that everything felt as if it were not only shaken but overturned. My mother hurried into my room and found me already getting up to wake her if she

were still asleep. We sat down in the forecourt of the house, between the buildings and the sea close by. I don't know whether I should call this courage or folly on my part (I was only 17 at the time) but I called for a volume of Livy and went on reading as if I had nothing else to do. I even went on with the extracts I had been making. Up came a friend of my uncle's who had just come from Spain to join him. When he saw us sitting there and me actually reading, he scolded us both – me for my foolhardiness and my mother for allowing it. Nevertheless, I remained absorbed in my book.

By now it was dawn, but the light was still dim and faint. The buildings round us were already tottering, and the open space we were in was too small for us not to be in real and imminent danger if the house collapsed. This finally decided us to leave the town. We were followed by a panic-stricken mob of people wanting to act on someone else's decision in preference to their own (a point in which fear looks like prudence), who hurried us on our way by pressing hard behind in a dense crowd. Once beyond the buildings we stopped, and there we had some extraordinary experiences which thoroughly alarmed us. The carriages we had ordered to be brought out began to run in different directions though the ground was quite level, and would not remain stationary even when wedged with stones. We also saw the sea sucked away and apparently forced back by the earthquake: At any rate it receded from the shore so that quantities of sea creatures were left stranded on dry land. On the landward side a fearful black cloud was rent by forked and quivering bursts of flame, and parted to reveal great tongues of fire, like flashes of lighting magnified in size.

Soon afterwards the cloud sank down to earth and covered the sea; it had already blotted out Capri and hidden the promontory of Misenum from sight. Then my mother implored, entreated, and commanded me to escape as best I could – a young man might escape, whereas she was old and slow and could die in peace as long as she had not been the cause of my death too. I refused to save myself without her, and grasping her hand forced her to quicken her pace. She gave in reluctantly, blaming herself for delaying me. Ashes were already falling, not as yet very thickly. I looked round: A dense black cloud was coming up behind us, spreading over the earth like a flood. 'Let us leave the road while we can still see', I said, 'or we shall be knocked down and trampled underfoot in the dark by the crowd behind'. We had scarcely sat down to rest when darkness fell, not the dark of a moonless or cloudy night, but as if the lamp had been put out in a closed room. You could hear the shrieks of women, the wailing of infants, and the shouting of men; some were calling their parents, others their children or their wives, trying to recognize them by their voices. People bewailed their own fate or that of their relatives, and there were some who prayed for death in their terror of dying. Many besought the aid of the Gods, but still more imagined there were no Gods left, and that the Universe was plunged into eternal darkness for evermore. There were people, too, who added to the real perils by inventing fictitious dangers: Some reported that part of Misenum had collapsed or another part was on fire, and though their tales were false they found others to believe them. A gleam of light returned, but we took this to be a warning of the approaching flames rather than daylight. However, the flames

remained some distance off; then darkness came on once more and ashes began to fall again, this time in heavy showers. We rose from time to time and shook them off, otherwise we should have been buried and crushed beneath their weight. I could boast that not a groan or cry of fear escaped me in these perils, had I not derived some poor consolation in my mortal lot from the belief that the whole world was dying with me and I with it.

At last the darkness thinned and dispersed into smoke or cloud; then there was genuine daylight, and the Sun actually shone out, but yellowish as it is during an eclipse. We were terrified to see everything changed, buried deep in ashes like snowdrifts. We returned to Misenum where we attended to our physical needs as best we could, and then spent an anxious night alternating between hope and fear. Fear predominated, for the earthquakes went on, and several hysterical individuals made their own and other people's calamities seem ludicrous in comparison with their frightful predictions. But even then, in spite of the dangers we had been through and were still experiencing, my mother and I had still no intention of leaving until we had news of my uncle'.

The volcanic eruptions which are similar to those as described by Pliny now bear his name: They are called 'plinian eruptions'. These eruptions produce 20–40 km high clouds and spread over hundreds and thousands of square kilometers by ejecting millions of tons of volcanic debris into the atmosphere in 20–50 h of activity. In the atmosphere, these clouds expand and when they reach the stratosphere disperse radially and form shapes like the branches of a large Mediterranean pine tree. Ash and pumice in volcanic clouds reflect the Sun's rays back into space and may cause very little light to penetrate through them, turning the day into the night as Pliny tells us. In his second letter, Pliny notes that numerous earthquakes shook the region for days before the eruption, but that this activity was considered normal for Campania. Cassio Dione[108] also describes that the alerting signs of the eruption consisted of unannounced and violent earthquakes, underground thunder, and an 'expulsion of a cap or plug' after an enormous uproar. The ejection of stones was followed by the ejection of large quantities of smoke which caused a hasten escape and panic among the population:[108] 'From houses into streets, from the outside to the inside, from the sea to the land, and from the land to the sea; they were all distracted as they searched for new places to hide. And while all of this was going on an indescribable quantity of ash transported by the wind covered the land, the sea, and the entire atmosphere'. Pliny also tells us that the cloud on 24 August expanded all over the Vesuvius area, and during the night and the following day as far as Miseno and entire Bay of Naples. At Stabia his uncle also experienced violent earthquakes, a day turned into night, and death from suffocation or inhalation of ash and poisonous gas (carbon and sulfur oxides). Miseno was also affected by continuous earthquakes, retreat of the sea from the coast (more precisely the coast from the sea because of the bulging of the volcano), an erupting cloud that produced intermittent darkness and twisted flashes of light, and falling ash and pumice that produced the hazard of being trapped by the collapsing buildings. According to Pliny, this caused fear, panic, and a hasten escape of the population into the surrounding countryside. Lighting during eruptions is a common phenomenon, caused

by the buildup of the electrostatic charges from the collisions of billions and billions of ash particles.

For the inhabitants of the Vesuvius area, the eruption of 79 A.D. must have been a terrifying experience. Pliny tells us that 'many besought the aid of the Gods, but still more imagined there were no Gods left, and that the Universe was plunged into eternal darkness for evermore'. The calamity also produced some prophetic-religious interpretations:[109] 'When from the torn rocks of the italic earth the gleaming fire arrives to the vast sky and burns many cities and destroys many men, large quantity of fiery smoke fills the great ether and lapilli fall from the sky like red lead, then it will be known the anger from the celestial God on those that had annihilated the innocent origin of the pious'; and 'some thought that the Titans revolted again, whereas the others that the entire Universe stretched and disintegrated in chaos and fire'.

In Miseno Pliny was more than 30 km from Vesuvius and still experienced violent earthquakes and an air very difficult to breathe. This suggests that a similar eruption today would cause a much greater anxiety and panic among the population, because of the much greater population density on the territory. In all, the eruption appears to have produced only about 3000 victims, although the city of Pompeii consisted of about 20 000 inhabitants and was buried under more than 4 m of volcanic debris. The fate of Herculaneum was even worse. This town was buried under more than 10 m and in some places 20 m of pyroclastic debris that is very difficult to excavate because of the underground water which had consolidated the pyroclastic material into a very hard matrix.[110] It appears that most of 20 000 Pompeiians and 5000 Herculaneans escaped from the cities on or before 24 August, before the onslaught of pyroclastic surges and flows. These currents reached large distances from the volcano and many people who initially escaped from pumice and ash fall were probably surprised later by these ground-hugging currents and perished. There were also other towns around Vesuvius (Cossa, Leucoptera, Oplontis, Sora, Taurania, Tora, etc.) whose faith is not known today. Naples and the surrounding territory are today densely populated and surely hiding many more secrets of the 'missing' Pompeiians, Herculaneans, and others.

Two thousand years later Pliny the Younger's description of the eruption has been augmented with new information from archeological excavations at Pompeii and Herculaneum, and studies of eruption deposits. These studies show that at Pompeii most escaped, but not all: A beggar collapsed and died at the Nucerian gate, a chained dog agonized before perishing from the falling rain of volcanic debris, at the House of Diomedes 18 people took shelter in the cellar but could not contain the poisonous fumes from seeping in and perished from suffocation, some greedy tried to hide valuables in a well and fell into it and perished, at the gladiators' barracks a woman with fine jewels perished along with a crowd, a porter at the Villa of the Mysteries remained entombed on his post, the priests of Isis tried to flee with statues but a row of columns collapsed and crushed some of them, a family close to the southern wall tried to run away but could not orient itself and its members suffocated, and still others threw their clothes away so that they could run faster, but it was too late. In all more than 2000 perished, but Pompeii is still

partially buried (about 30%) under several meters of volcanic debris and hiding more of its secrets.[111]

Only 7 km away at Herculaneum, Vesuvius began raining ash and pumice on the surrounding countryside and most escaped for those that didn't were soon preserved for posterity: A soldier from the Roman Legion, a lady with a ring, a man near a boat, a pretty lady, a family of seven under an arched chamber of the marina remained huddled together as if trying to protect themselves from the suffocating air. Hundreds of others in these arched chambers also could not escape while most of 5000 Herculaneans[112] apparently did. After the tragedy, Herculaneum and Pompeii were forgotten for the next 17 centuries, as the new colonizers came and built Resina on top of the ruins produced by Vesuvius. In the Middle Ages, Resina became a town of slums and changed its name to Ercolano only when discovering the roots of its glorious past. The story of resurrection and plundering of Herculaneum and Pompeii some 1700 years later forms another fascinating story[48] of Vesuvius' ability to resurrect its victims and mesmerize those that have not yet been victimized.

And so we came to the end of our story of Pliny the Elder and how he confronted personally the eruption in 79 A.D. and how he died. He died as a hero not so much because he wanted to help or sacrifice his life, but most likely because his curiosity led him to investigate a new natural phenomenon and his duty forced him to take action. If he did not sail on 24 August we would have no written record of this eruption and much to speculate. At Pompeii and Herculaneum, Vesuvius preserved in miniature the life of twenty centuries ago, and it is through this kind of information that we are better able to understand our roots and our aspirations. We will conclude with Pliny the Younger's epitaph:[113]

> *The fortunate man is he to whom the Gods have granted the power either to do something which is worth recording or to write what is worth reading, and most fortunate of all is the man who can do both. Such a man was my uncle.*

C. Evaluation for understanding of romantic qualities

The above story of the eruption of Vesuvius in 79 A.D. can be shortened or lengthened, depending on the teacher's taste and students' capacity of engagement. Before concluding with the topic the teacher can divide the class into groups and let them investigate different details of the story and present their results in class. The students can then be questioned on the familiarity with the issues of the story: The heroic, ethic, or moral qualities of Pliny the Elder, the kinds of eruptions that Vesuvius can produce, the destructive potential of the volcano, why are the ruins of Pompeii and Herculaneum important, what is the scientific legacy of Pliny the Elder, what are the roots of Neapolitans, what would be the consequences of a similar eruption occurring today, and so on. The students should not only understand the content of the story, but also be able to imagine what the content implies or how this can be used in other situations. A desirable outcome from this story would be that the students' capacities begin to exceed the romantic associations; that they begin asking such questions as: 'What lessons does the story teaches?' or 'How can we protect ourselves and our territory from future eruptions?'

2.5.2.3. Example 2: Scuola Media Statale Orazio Comes, Portici

At the intermediate school Orazio Comes of Portici, the teacher Annamaria Imperatrice and her colleagues Nicola Ciobo, Giuseppina Donatiello, and Franca Vigilante have been involved in teaching Vesuvius to the students since 1995. Together with their students they have participated at several exhibitions,[114] made excursions on Vesuvius, and visited museums and ruins of Pompeii and Herculaneum. They also collaborated on an educational book on Vesuvius[115] and in 2004 participated at a forum dealing with the volcanic risk.

This forum on VESUVIUS 2000 provided the teachers with an opportunity to reflect on the students' learning accomplishments and produced more effective Vesuvius teaching programs. The majority of students entering Comes have never been taught about Vesuvius in elementary schools, those who are aware of the volcano have a very fragmentary and erroneous knowledge, and many students employ wrong words to describe its characteristics.[116] Some students even want to give Vesuvius away to other Italian provinces! This is rather disturbing and produces difficulties to the teachers when teaching students with diverse cultural backgrounds. The teachers employ some of the romantic tools of the educational process, but they are not convinced that the current education on Vesuvius is very effective, because of the lack of a uniform educational strategy on the territory. Nevertheless, the teachers at Comes aim to promote the security rather than the emergency culture, and in particular teach the students that the negative habits of patronage, conformity, and crime produce only social and economic degradation of their environment.[117]

A. Identifying transcendent qualities

Teachers from Comes are aware that the eruptions of Vesuvius are very dangerous, because too many people live too close to the volcano in densely populated areas. They guide the students in discovering the characteristics of their territory by researching historical sources, exploring the environment through excursions, and collecting and sorting information from magazines, newspapers, and books. This, we recall, is one cognitive tool of romantic understanding which establishes in students' minds the limits of reality by making them feel the authorities of the theme being investigated. Other transcendent qualities of the heroes and personalities of the Vesuvius area are investigated through the stories of Vesuvian Villas, Grand Tour travelers, and by reading Pliny the Younger's letters of the heroic qualities of his uncle during the eruption of Vesuvius in 79 A.D.[118] The students add content to these stories through field excursions, visits to the ruins of Pompeii, Oplonti, and Herculaneum, and by examining the rocks and seismic instruments at the museum of the volcanological observatory.

B. Organizing topics

Following the students' observations and excursions on Vesuvius and collection of rocks, taking of photographs, and gathering of other relevant material, they are guided by the teachers to explore this material in greater detail through reading assignments and conducting research in libraries. This information is then sorted into different groups: Plants and animals, poetry and songs, volcanology, diaries of

Grand Tour travelers, local products of the area (such as famous wines), and eruptions of Vesuvius by beginning with the inscription on the marble plate in Granatello.[119] For the purpose of acquiring a better understanding of the interaction between the people and their environment, the teachers also guide the students to examine the economic activities of Portici in terms of soil fertility, presence of historic villas (such as La Reggia), and the possibility of developing tourism and other service and manufacturing businesses.

C. Concluding topics

As the end products of their studies, the students produce reports, hypertexts, posters, articles for local publications, and posters and models for presentations at exhibitions. Fig. 2.4 illustrates some typical activities of the students of Comes.

My journey ... to Vesuvius (*Il mio viaggio ... al Vesuvio*) is the most recent work on Vesuvius produced by the students of Comes (see Appendix) where the volcano is presented from its historic, scientific, geographic, and cultural perspectives. The students' imaginations are presented through a cartoon illustrating the important events of the territory and transcendent qualities of some of its illustrious personalities. The themes include the myth behind the volcano; Spartacus' struggle to free the slaves from the oppressive Roman rule; Bacchus representing the fertility of the land; non-awareness of the people of the danger from the volcano and confrontation with it in 62 A.D. during an earthquake; premonitory signs leading to the eruption in 79 A.D.; the effects of this eruption on the surrounding territory; Pliny the Elder's heroic effort to aid the population in danger and Pliny the Younger's first ever description of a volcanic eruption; the terrible eruption of 16 December 1631 that devasted the coastal towns surrounding Vesuvius; Grand Tour travelers Hamilton and Goethe who during the Enlightenment were exploring the nature of the volcano and spreading their knowledge through scientific and literary works; rediscoveries of the buried cities of Pompeii and Herculaneum in 1700s and diffusion of the importance of these discoveries; successive birth of Vesuvian villas; importance of the Neapolitan saint San Gennaro in protecting the population from the furies of the volcano; the first important eruption of the twentieth century and the efforts of Liberal Italian regime to manage its effects on the population; the last eruption of Vesuvius in 1944 during the Allied occupation in World War II; settlement of hundreds of thousands of people on the slopes of the volcano following this war; and the little useful Vesuvius Evacuation Plan for managing 1 million people around the volcano. Through this work, the students are guided in discovering their roots and their precarious cohabitation with the volcano.

D. Evaluation

The teachers evaluate the students not only in terms of the acquired information about the volcano, but also by looking at such qualities as being proud of their territory and conscious of their rights to reject corruption, crime, pollution, conformity, and patronage: 'The plagues that infect all of us and deprive us of our rights and make us behave as moaning sheep who march in group and accept passively the decisions of others'.[116]

Fig. 2.4. A sampling of educational projects on Vesuvius produced by the students of the intermediate school Orazio Comes of Portici. The projects include volcanic risk, composition and products of Vesuvius, flora, fauna, and park of Vesuvius, Grand Tour travelers, and Vesuvian villas and other cultural patrimonies. From top left in clockwise direction: Students' school exhibition, June 1996; exhibition at Museo Nazionale Ferroviario di Pietrarsa, 16 December 1997, Portici; exhibition at S.M.S. Don Milani, 16 December 1999, Portici; Grand Tour travelers, December 2004; Vesuvius seen from the port of Portici (Granatello); stone memorial in portici[119] erected in 1632 following the subplinian eruption in 1631; class 2E with the teacher Annamaria Imperatrice on the right, December 2004; students from Comes and Don Milani, exhibition at Museo Nazionale Ferroviario di Pietrarsa, 16 December 1998, Portici. Colour version (see colour plate section in the Prelims).

2.5.2.4. Example 3: Istituto Comprensivo Statale Francesco d'Assisi, Torre del Greco

Since 1995 when the teacher Gelsomina Sorrentino and her colleagues first became aware of the educational objectives of VESUVIUS 2000,[120] teaching students about Vesuvius at Istituto Comprensivo Statale Francesco d'Assisi has become a high priority.[121] These teachers realized that before making the students aware of the problems posed by the volcano it is necessary to make themselves aware of a 'new conscience' as citizens who live and work very close to one of the most dangerous volcanoes in the world. They thus began to learn for themselves, participate at meetings dealing with the volcanic risk, study various territorial plans, and acquire information that would make them more conscious of the environment and the problems associated in dealing with it. From their effort grew a volcano laboratory at the school and an awareness of the multidimensional nature of Vesuvius and its environment.[122] This led to the studies pertaining to different types of eruptions, including that of 79 A.D. which is vividly described by Pliny the Younger. But Vesuvius is more than eruptions: It is people and their problems in dealing with high unemployment,[123] housing speculation too close to the crater of the volcano, poor and little respected urban plans, and deeply rooted organized crime. These are the problems that cannot be solved unless 'we search for solutions by starting from the grassroot level; without delegating the problems to others because they have failed to resolve them for us'. These reflections helped to define a new project entitled, 'Vesuvius: In search for roots through history, nature, and economy'.[121]

This project is addressed to a class of about 20 students who are about 10 years old. The students meet for 2 h every week from October until June, or for a total of 120 h. The objectives of the project are to prepare the students in dealing with their environment, make them objective observers of the territory and protagonists of community life through individual and group involvements, and discover and value the patrimony surrounding the volcano for the purpose of promoting a rebirth of new prosperity of the area.

A. Identifying transcendent qualities

The students devote 40 h to the identification of key protagonists of the territory and their qualities as leaders, heroes, and statesmen. This requires identifying historical and scientific data pertaining to people and different eruptions of Vesuvius by beginning with the one in 79 A.D. and ending with the last one in 1944; developing students' capacities to understand written, oral, and visual sources of information; evaluating Vesuvius Evacuation Plan and VESUVIUS 2000; identifying towns buried by Vesuvius, villas constructed by the Bourbons, and conservation efforts being implemented at the ruins of Pompeii and Herculaneum; and gathering educational and socio-economic data of the territory from various sources.

B. Organizing topics

The students devote 80 h to studying the eruptions of Vesuvius; to the understanding of the purpose, art, and architecture of seventeenth century Vesuvian villas; to the Park of Vesuvius and its flora, fauna, and economy of Torre del Greco;

and to the history, function, and publications of *Osservatorio Vesuviano*. They also visit the crater of Vesuvius, its park, and its sea environment, explore the Church of Santa Maria of Constantinopoli and the ruins of Pompeii and Herculaneum, and visit the museum of the observatory. After each visit the students produce reports of their discoveries and sort out the information according to different categories. They learn how to use key words associated with different topics and add content to the topics by investigating how natural phenomena can have positive and negative influences on people. They are taught how fear from the volcano can endanger an emergency situation, how to research documents pertaining to the functioning of the volcanic system, what governmental and non-governmental institutions deal with volcanic risk and what services they provide, how to make connections between different types of eruptions and plate tectonics, and so on. The students then group the information into topics for oral and written presentations, and are encouraged to participate at meetings dealing with the issues of their territory.

C. Concluding topics

At the conclusions of key milestones of each theme of the project, the students present their works in class and to their families during frequent encounters between teachers and parents. At the end of the project the students produce written reports, multimedia CDs, and posters and models for displaying at exhibitions and competitions outside of the school. Fig. 2.5 summarizes some of these activities.

D. Evaluation

The students are not only evaluated for their understanding of various topics, but also for their capacities to value the problems of the society and its associated legal structures, acquire positive views toward school and social organizations, change their views of how to confront and cohabit with the environment, deal with panic in difficult situations, understand the concept of risk and elements of individual and collective protection and why each one should act responsibly, improve relations with adults and transfer knowledge about Vesuvius to their families, overcome communication problems, open themselves to dialogs and collaboration, and become conscious members of the society.

'The President of the school, teachers, and the committee in charge of evaluating students' performance agree that the project's objectives have been substantially achieved. On the cognitive level, the students understand volcanoes better and Vesuvius in particular, are familiar with objectives and differences between evacuation plans and VESUVIUS 2000, participate and help at the meetings, study letters of Pliny the Younger and chronicle of Braccini, read diaries and letters of Grand Tour travelers, and are largely aware of Morgan's tables and the risk from Vesuvius. On the metacognitive level, the students have confidence in the acquired knowledge and feel the exigency to communicate with the adults and their experiences. By learning in school and participating at meetings, the students have confidence in science and in the scientists who are attempting to reduce the risk from Vesuvius, feel confident in making their representatives more conscious of their needs, demonstrate more maturity, know how to intervene at public meetings, and in general know how to live

Fig. 2.5. A sampling of educational projects on Vesuvius produced by the intermediate school students of Istituto Comprensivo Statale Francesco d'Assisi of Torre del Greco. From top left in clockwise direction: Earth's internal structure, 1995; Pliny the Younger letters, 1996; eruptions of Vesuvius, 1997; lava flow of 1794 destroying Torre del Greco, 1998; teacher Gelsomina Sorrentino (center) with her students, 2005; students and teachers associated with the special student project discussed in the text. Colour version (see Colour plate section in the Prelims).

better on the territory. The children live today with less fear than a decade ago, with less apathy, are readier, more conscious, and perhaps they will be more responsible citizens tomorrow. It is regretful, however, that most children of the territory are not being educated on Vesuvius as they should. Today such an education is indeed possible, because of the school reform law of Bassanini[124] that guarantees the autonomy in instruction. It is thus the responsibility of the teachers to provide the right education to the children of the Vesuvius area'.[121]

2.5.2.5. Example 4: Scuola Media Statale Rocco Scotellaro, Ercolano

The intermediate school Rocco Scotellaro in Ercolano is at the forefront in providing all of its students with an education on Vesuvius and its environment. From November 1995 when the educational objectives of VESUVIUS 2000 were first presented at this school, its teachers have been actively participating at several scientific and educational meetings, seminars, and exhibitions. Today, the school curriculum requires that its students acquire a broad knowledge of the territory, produce reports and models of diverse topics being studied, and participate at internal and external competitions and exhibitions. Through this environmental program, the schoolteachers Elvira Maddaluno, Gianfranco Gambardella, and Annamaria Scorza discovered that other teachers have become more sensitive to the problems surrounding the volcano, that their involvement on these problems has increased, and that this initiative should be sustained if the school is to play a positive role on the territory. This requires dedication and hard work on curriculum development and evaluation of students for knowledge acquisition.[125]

Rocco Scotellaro requires that its students actively participate in identifying the surrounding in which they live. They are guided to explore the territorial problems and understand their complexities, and how these problems interact. The students are also encouraged to go beyond their cultural achievements through their creativities and abstract ideas (Fig. 2.6). The teachers employ the tools of mythic understanding as well as the higher-level cognitive tools of romantic and philosophic understanding. In the past, the students produced a risk map of the area around their school, a magic cube showing different aspects of the volcano, and VESUVIUS 2000 songs and poems.[126] Fig. 2.7 shows a sample of these activities. More recently they studied water and its distribution by the Vesuvian aqueduct through philosophers, myths, religion, geology, ecology, and sanitary and environmental education.[127] Their most recent effort contains the following educational elements.

A. Identifying transcendent qualities

The Jailed Volcano[128] is the most recent project of Rocco Scotellaro and represents an attempt to orient the students and their families toward a sustainable future. In particular, the project aims to develop those methodologies which allow the student to pursue the duplicate role of a citizen and a consumer. As a citizen, one needs to recognize and obey the laws of the society, and as a consumer one should not compromise the environment beyond one's prudent needs. One must

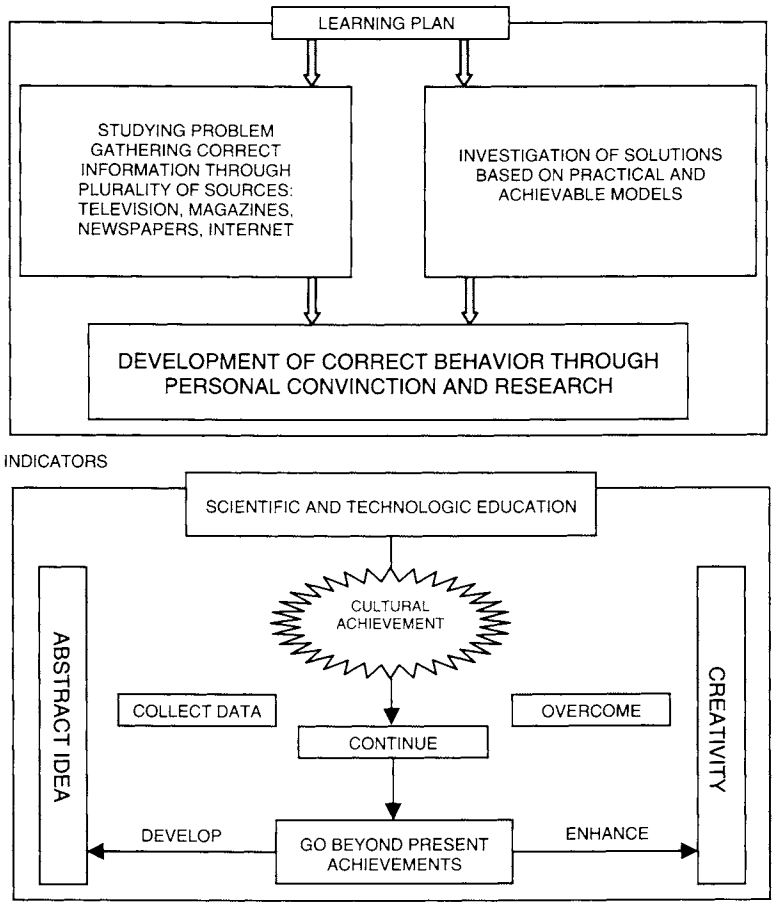

Fig. 2.6. Schematic representation of educational process at the intermediate school Rocco Scotellaro of Ercolano.

cohabit with the environment made of people, plants, animals, businesses, and institutions which should interact harmoniously.

B. Organizing topics into narratives

Vesuvius is the most famous volcano in the world and interacts with the environment with its eruptions. A story is thus built around volcanoes and how they work. This leads to Vesuvius which functions like many other volcanoes, but unlike many of them it is famous because it strongly interacts with the people on its slopes and contributes to the growth of western culture. Vesuvius is thus a great creator of civilization and one needs to explore its slopes to understand its ecosystems, its products, and its dynamic aspects. This leads to the descriptions of plants, animals, noted landscapes, towns, and population distributions. Vesuvius, its eruptions, and the history of people on its slopes are presented through the testimonies of writers, poets, and musicians. Additional content is built from class readings of various

Fig. 2.7. Sample of students' activities at Rocco Scotellaro, 1995–1998. From top left in clockwise direction: Construction of a model of Vesuvius and magic cube, aided by the teachers Elvira Maddaluno (center) and Gianfranco Gambardella (top right); music group playing the songs 'VESUVIUS 2000' and ' 2000 Vesuvians on a train'. Colour version (see colour plate section in the Prelims).

documents, such as books and magazines, through collections and classifications, and students' excursions on the territory and ruins of Pompeii and Herculaneum. The story identifies a disequilibrium between man and nature, and guides the students in imagining what needs to be accomplished to produce a more harmonious coexistence.

C. Concluding topics

The Jailed Volcano (*Il Vulcano Ingabbiato*) is the end result of students' involvements and includes a collection of drawings, photographs, poems, and descriptions of stories about the people and natural phenomena. Fig. 2.8 illustrates the cover page of this work and the project's objectives aimed at understanding the Vesuvian environment and how to interact with it correctly.

D. Evaluation

The students are evaluated on the basis of their involvements with the topics and understanding of details, interactions among themselves, changes in class behavior, interactions with other projects, transfer of information to their families, readiness to participate in dialogs and collaborations, and quality of final products.

Fig. 2.8. Cover page of The Jailed Volcano and the project's objectives, produced by the students of Rocco Scotellaro during the school years 2003–2004.

2.5.3. Teaching secondary school children

2.5.3.1. Methodology

Imagination is the ability to think that things are possible and is a source of flexibility and originality of humans. The theoretic imagination is enhanced by cultural discoveries and innovations, and engaging students' imagination is crucial to successful learning. The tools of mythic and romantic understanding, such as stories, binary opposites, associations with the limits of reality and with heroes, sense of wonder, etc., do not disappear as we develop theoretic abstractions; it is just that our mode of thinking changes as new cognitive tools become available to us. We want to know about things from more detailed and rational perspectives and form general schemes and a language that support theoretic abstractions. We want to integrate new symbols of social, physical, psychological, and other processes into general schemes comprised of hypotheses, theories, and natural laws. These in turn allow us to produce a sense of abstract reality which we then try to connect with the concrete world. This back and forth process develops our minds, and instead of merely looking at separate pieces, at extreme features, or limiting characteristics of the environment, the philosophic thinking makes us look at the relationships between these pieces and of schemes that unite them. The use of language becomes

more sophisticated as we try to connect the words with their roots and thus discover other dimensions and relations which led to these words. The teachers can explore different theoretic paths, depending on the extent of students' theoretical capacities which are only partially accessible to the majority of secondary school students. When the romantic cognitive tools are fully acquired, the acquisition of philosophic ones becomes easier and more complete.

Some of these philosophic tools are: Sense of abstract reality, sense of agency, group of general ideas and their anomalies, search for authority and truth, and meta-narrative understanding.[129] The sense of abstract reality develops from our understanding of how natural processes work; how we can control nature by linking processes into schemes that control them. With this scheme comes a realization that one forms a part of the processes; that one has a past which is linked to the natural processes. Students with the ability of theoretic thinking become increasingly aware that they form a complex chain of biological, social, and cultural processes, and the teacher can develop this cognitive tool by encouraging students to engage in activities that will stimulate their sense of agency. Examples of this can include students interviewing the protagonists of different volcanic risk mitigation projects for the territory, writing letters to local and national representatives on particular issues of the environment, and involving themselves in some activities that provide service to the society.

When using the tool of forming general ideas about nature, society, economics, etc., and dealing with the anomalies to those ideas, the students are led to their inadequacies and the process of building more complete and often more complex structures. The single events are not seen anymore as isolated dramas, but in terms of their causes and consequences. For example, the non-existence of an adequate volcanic risk mitigation policy for the Vesuvius area can be seen in terms of abusive urbanization caused by the demographic pressure on Naples in 1950s and 1960s, organized crime thriving in a poor socio-economic environment, negative habits of mind (patronage and conformity) of Vesuvians, incompetence of risk managers and their scientific advisors, and so on. The consequences of this are anxiety and fear for safety on the part of the people, degradation of social services, losses of business activities, slow cultural growth, or even a catastrophe when the volcano erupts. Questioning and answering in defense of some hypothesis (dialectic) normally leads to an increasing sophistication in the methods of argument, but not necessarily to an agreement about the truth. Counter-examples are a good way to bring out anomalies of hypotheses or theories and, consequently, to their reformulation, with the students recognizing that the general truths are not achievable.

Those who acquire philosophic understanding do not accept anymore some beliefs that they have inherited, but seek security in those which are located in the abstract theoretic thinking, where the authority and truth may be located. The preferences for new ideas and beliefs are based on new criteria which is turn are being reflected upon and revised. The facts about Vesuvius can thus be presented in the context of plate tectonics, evolution of the Solar System, or even in the context of the evolution of the Universe itself: From pure energy to energy and matter. How did it all begin? How did the life on Earth come about? Is there a certainty that Vesuvius will erupt again, and if not why not and can this be quantified? The point

is that the imagination in students will be more readily engaged if the particular is seen from a more general context, and in particular if this context can challenge or support an idea or belief. Such contexts are parts of meta-narratives or techniques for organizing beliefs, ideas, facts, or events into wholes with which one can associate emotionally. For many, meta-narratives may provide a powerful tool to see themselves as being able to grasp the truth: The Plato's privileged position of educated person. There are, of course, dangers in relying too much on large narratives, but used prudently they are more stimulating to the students than just focusing on curriculum itself.

It is not easy to develop a world of abstract ideas in students, for this can only be managed if there is a community around them that supports this world. We simply cannot continue on and on in finding anomalies, because this would bring about an insecurity in the students and a difficulty in confronting the real world over which we have certain control. A theory, a principle, or a physical law is valid as long as we realize its limitations and not because this represents a universal truth. The more we know, the more our imaginations are telling us how little we know. Philosophic understanding of a topic may be understood easier by beginning to describe it with mythic and romantic elements, and then gradually mapping the limits of these understandings through the use of philosophic cognitive tools.

In this philosophic activity the students recognize themselves as parts of complex processes where an understanding of these processes also leads to the discovery of the truth about themselves and their environment. A person who is skilled in philosophical thinking is often the most effective in getting to the heart of the matter; at being able to think about an issue clearly and then act on it decisively. Systematic development of philosophic understanding appears, however, at present normal only for a small proportion of the population which adequately accumulated mythic and romantic capabilities. The philosophic method forms a basis for interdisciplinary projects and it is thus necessary, for an effective risk mitigation in the Vesuvius area, to acquire this capacity.

A. Identifying general schemes, ideas, or theories

What ideas, theories, metaphysical, or physical schemes best organize the topic into a coherent whole?

The teacher should select a scientific, political, social, economic, philosophic, or any other theory which stirs an emotion in him and which has some controversies associated with it. One can examine what are the philosophical or ideological sides of the idea or theory, what scientific data support it and what data do not support it, what are its limitations, what are the controversies, why people argue about it. The topic should be of relevance and not evident to the students before hand. In our situation we can think of several schemes: Prediction of future eruptions of Vesuvius, structure of the volcanic system, deposits of past eruptions, art and literature on Vesuvius, mitigation of volcanic risk, educating people about the risk, social and political obstacles in dealing with the Vesuvius area, environmental effects of eruptions, and so on. Each of these topics has its physical, social, or political dogma and enough controversy to make it powerful and relevant.

B. Organizing content into a theory

How to make the theory vivid, what content exposes the theory, and what narrative best captures its structure?

Theories attempt to provide a complete explanation of the topic, but fail in one or more ways to explain its truth. The teacher needs to sort out what the theory explains and what it does not or fails to explain adequately. If we take the topic of predicting future eruptions of Vesuvius we can argue that this theory is more reliable when the volcano is about to erupt and fails to be reliable in other situations. We can argue scientifically that in the former situation the premonitory signals of the eruption (seismicity, ground deformation, fumarole activity) are better understood than in the latter case. Since most people living around Vesuvius want to know the date of the eruption, this topic is vivid and of relevance. To shape the structure of this theory or produce a meta-narrative we can choose Vesuvius Evacuation Plan and explain how it fails to recognize the limits of predicting eruptions and as a consequence how it can produce a catastrophe on the territory or expenditure of enormous resources in the event of a false prediction. We can also explore the reasons why the risk managers keep assuring people that they can protect them, while the theory of eruption prediction has large scientific uncertainties.

C. Anomalies and alternate theories

What content of the theory can be challenged and with what methods? What alternative theories and narratives can organize the topic?

All theories are incomplete, some more and some less, and the teacher needs to focus on those aspects of the theory which present a challenge to the theory. The aim here is not to convince the students that the theory is useless, but only that it has limitations and what these limits are. To address these anomalies the teacher should guide the students into conducting research and involve them in group discussions. The idea is to make the students see that the anomalies require a revision of the theory, which in turn may produce other anomalies and further revision. It is also important for the students to see how the idea or theory is used in the real world and how this brings about the sense of agency. In our theory of predicting eruptions we have seismic, gas, ground deformation, magnetic, and other anomalies, with each one having its own limits of accuracy and validity as a useful premonitory tool. Deformation of ground and seismicity of certain frequency are usually better indicators of an eruption than other parameters.

If there are alternative schemes to organize the topic then these should be provided to the students, or the students should be guided in exploring these alternatives. These may be more complete, in the sense of explaining a greater number of phenomena, but also more complex and not within students' easy reach. For example, the Newtonian theory needs to be replaced by quantum mechanics for atomic-scale processes and general relativity for astronomical-size objects. As an alternative scheme to using seismic and ground deformation parameters for predicting eruptions and thus employing this information for evacuating 600 000 people from the Vesuvius area, we can choose an alternative risk management

scheme that does not depend on evacuating so many people. In this situation, we would not depend anymore on the weaknesses of evacuation plans, but may have to deal with the anomalies of the new scheme. As an example, we could confront Vesuvius Evacuation Plan with VESUVIUS 2000 as illustrated in the example below.

D. Conclusion

How to ensure that the students do not become disillusioned with the idea or theory because this does not represent the truth?

The general scheme presented to the students should not be made rigid nor destroyed, but recognized as having a potential utility rather than being objectively truthful. The teacher must stress what are the strong and what are the weak foundations of the theory, and what additional knowledge may eliminate, or at least reduce, the weak links. Philosophic understanding comes with the realization that the search for truth is eternal, or that we may approach it but cannot attain it. It is important in concluding the topic that the students see the difference between the emotional side of the theory and the facts that support it or do not support it. The former are subjective and the latter are objective data. A scientifically sound theory has no room for subjectivity.

E. Evaluation

How to evaluate whether the students understood the content of the theory, its usefulness, and its limitations?

The teachers should look for evidence that the students have learned the content of the lesson and how well they used the theory or general scheme to organize the content. For this purpose, use can be made of students' written reports and oral discussions, their use of theoretic language that is appropriate to the topic, and how critically they examined and studied literature pertaining to the topic.

In our example pertaining to the theory of predicting eruptions, the students should be evaluated for their understanding of the methods used for such predictions, decision problems dealing with alerts and evacuations, subjectivity and objectivity of data anomalies, emotions and facts behind the theory, differences between different approaches, professionalism in their reports, and for their individual and group involvements and collaborations. The students should demonstrate that they understand the topic in its complexity and come up with clear conclusions what strategy or investigation is required to make the theory better or come closer to the truth or solution of the problem that is implied by the scheme.

2.5.3.2. Example: Istituto Tecnico Commerciale Luigi Sturzo, Castellammare di Stabia

There are some scattered examples of teaching on the philosophic level in the secondary schools of the Vesuvius area and some of these are reported in the book Vesuvius Risk Education.[130] These examples deal with eruptions of Vesuvius[131] and evacuation of students from a school in the event of an emergency.[132] Here we will consider an example from the secondary school Luigi Sturzo of

Castellammare di Stabia where the teacher Ida Mascolo guided two classes of students on a theme that deals with volcanic risk mitigation. The students examined theories and anomalies, interviewed experts, conducted research, and formed their own opinions about two different schemes.

A. Identifying volcanic risk mitigation schemes

Prof. Mascolo identified volcanic risk mitigation as being the theme of the project. This topic is of high relevance for most people residing close to the volcano, but very few can objectively evaluate what this implies for them and what are the consequences of choosing one scheme over another. Vesuvius Evacuation Plan is the official plan of volcanologists and deals with evacuating people in the event of an emergency. It is controversial in terms of eruption prediction, functioning of transportation and telecommunication systems, people abandoning their property and friends and being deported to distant Italian provinces, speculation of the abandoned territory, and re-entry after the eruption. VESUVIUS 2000 is the non-official risk mitigation plan and does not require mass evacuation. It deals with long-term prevention and requires interdisciplinary collaboration to achieve its objectives.[117]

During 1997–1998 and 1998–1999 school years, two classes of second year students from Luigi Sturzo participated at seminars on Vesuvius given by several experts, listened to debates among the experts, interviewed a civil protection authority, studied anomalies associated with different risk mitigation projects, and compared the projects for their modalities, methods, solutions, results, and consequences. The text below was taken verbatim from a report that the students prepared at the end of their study.[133]

B. Vesuvius Evacuation Plan and VESUVIUS 2000

Institutional voice

On 17 February 1999 four of us have interviewed the Director of Civil Protection of Pompei, Mr Romeo Spera, who before the interview furnished us with historic data about the origin of Vesuvius. The following is the transcript of the questions and answers session which followed:

Q: How is the Civil Protection of Pompei confronting the problem of Vesuvius?

A: In 1999 we promoted a municipal plan which is annually revised and which contains basic information on how to deal with the management of the catastrophe. This plan explains how the evacuation should proceed; for example, the people of Pompei, after being notified 1 or 2 days before the eventual eruption, will be transported to the port of Castellammare di Stabia and from there 3000 persons will depart by a ship to Liguria. In this manner seven risk areas will be evacuated in 7 days.

Q: How are you going to predict the eruption?

A: Before the eruption the instruments monitoring the volcano will detect various premonitory parameters (microseismicity, ground deformation, increase in fumarole activity) which will alert us and, if necessary, place in pre-alarm one or more areas of the territory.

Q: We understand from the informational pamphlet of Dr. Antonio Malafronte that this city is not exposed to the risk because it is included into the green area (area of low risk). How did you come to this conclusion?

A: The Commission of Large Risks of Civil Protection (*Commissione di Grandi Rischi*) identified 18 municipalities at risk in the Vesuvius area. Pompei was inserted into the green area on the basis of the distance from the volcano and the direction of prevailing winds.

Q: According to your knowledge, what is the typology of Vesuvius?

A: Vesuvius is situated on a fracture of the Earth's crust which contains a dense network of inactive volcanoes. One can therefore assume that Vesuvius is not an active volcano.

Q: How dangerous are the gases that are emitted from the crater of volcano?

A: The gases of Vesuvius have a sulfuric origin and therefore by covering mouth and nose with a wet towel one can breathe easily and at the same time be protected from the ash.

Q: We participated at several seminars held by the scientists of world fame and on those occasions it was stressed the need for a policy of prevention, because the prediction of eruption is not always possible. Can you tell us if you have any programs that supports the prevention culture?

A: Toward that end we periodically remind the schools of Pompei to educate the students and drill them on evacuations. These drills have shown that the evacuations are easy and fast. We also distribute a pamphlet which contains information on the volcanic risk.

From the interview and information given to us by the director, we inferred that the current emergency evacuation plan for Vesuvius assumes that the eruption will be predicted at least 2 weeks before and that about 700 000 people will be evacuated from the territory and distributed in different regions of the nation. Vesuvius Evacuation Plan promotes: Monitoring of Vesuvius by *Osservatorio Vesuviano*; possibility of predicting the eruption in 15 days; division of risk into seven levels on the basis of seismicity, ground deformation, geochemistry of gas, and gravimetry; utilizing ports, highways, and trains as the means of escape; distribution of people from the territory into communities all over Italy; re-entry into some areas after the state of emergency has been lifted.[134]

The alternative: VESUVIUS 2000

Several years ago an interdisciplinary project was proposed for the Vesuvius area, with the objective of producing guidelines for protecting people, property, and cultural patrimony from future eruptions. This project was elaborated by GVES and is being coordinated by Prof. Flavio Dobran. GVES also produced an educational volume entitled *Educazione al Rischio Vesuvio*[130] which we consulted to obtain information on the project. VESUVIUS 2000 distinguishes itself with a new methodology that frames Vesuvius in a global manner. For its realization it requires a colloboration of not only the geologists and volcanologists, but more importantly the experts from other disciplines, such as engineers, computer scientists, environmentalists, educators, urban planners, civil service volunteers, and above all the population.

This project gives a great deal of importance to the schools because these appear to be most suitable for producing the correct form of information which is indispensable for eliminating panic that comes from disinformation and scarce and inadequate knowledge. According to GVES, a civil nation should prevent catastrophes, and VESUVIUS 2000 is such a project for the Vesuvius area. Its basic premise is that it is possible for the people to cohabit with the volcano in security and that this cohabitation can produce socio-economic and cultural benefits to the people. VESUVIUS 2000 does not aim at a mass escape in the event of an emergency, but at preparing the people and the territory to confront this emergency with minimum cultural and socio-economic losses. The hazards from future eruptions cannot be eliminated, but their effects on the territory can be controlled by reorganizing the environment where people live and work. It is necessary to work toward the elimination of negative habits of mind or toward a security culture of prevention, instead of complying with an emergency culture which aims at deporting the population and destroying its culture.

The central objectives of VESUVIUS 2000 are the definition of the volcanic system of Vesuvius, and the eruption of 1631 in particular, for the purpose of developing a physico–mathematical model of the volcano with the capacity to assess future eruptions and their effects on the territory; assessment of vulnerability of population, important structures and infrastructures, and cultural patrimonies, such as the ruins of Pompeii, Oplonti and Herculaneum, as a function of different eruption scenarios; development of an appropriate educational methodology that aims at a security culture; and the establishment of safe and prosperous areas around the volcano. Making the population conscious of its environment can produce new cultural and economic opportunities, because this requires a reorganization of the territory.

Television debate

On 20 February 1999 RAITRE transmitted a program on Vesuvius and on this occasion interviewed Lucia Civetta (Director of *Osservatorio Vesuviano*), Giuseppe Luongo (Director of the Department of Geophysics and Volcanology at the University of Naples), and Franco Barberi (Undersecretary for Civil Protection).[135] The following is a summary of what they said.

Dr. Civetta affirms that the experts of *Osservatorio Vesuviano* control Vesuvius, but she does not deny the danger from the 'sleeping giant' which could become active at any moment. She also defends the evacuation plan and is certain that the eruption can be predicted on time for organizing the evacuation.

According to Prof. Luongo, such a prediction is not possible, since the eruption can be predicted reliably only few days in advance. It will be difficult to evacuate 700 000 people and there will be an incredible panic, infernal chaos, and everything will be blocked. There will be more dead from the panic than from the eruption itself. It will also be impossible to use the port of Torre del Greco because of ground movements. The same difficulties will be confronted with trains because the earthquakes will bring about a misalignment of railroad tracks. The professor denounced that the continuing support of *Osservatorio Vesuviano* with research funds has not produced any substantial results for the population at risk.

The Undersecretary of Civil Protection, Franco Barberi, reacted very hard to the statements of Prof. Luongo by attacking him personally and not professionally. He stated that Luongo changed his mind on the methodology because in the past he supported a different view. According to the undersecretary, the monitoring of Vesuvius has improved, new prevention measures have been developed, but nothing much has happened in decreasing the housing speculation on the slopes of the volcano.

The television program concluded with questions to the people of different cultural levels who live around the volcano. They jointly concur that there is no education, that the details of the evacuation plan are not known to the public, that the dimension of the risk is underevaluated, and that there is no effective strategy of prevention.

Voice of the student: opinions and reflections

At the end of television debate we had an intense discussion and remained perplexed on what we have understood, wanting to have more clarity and certainty from the emergency plan, and interested in acquiring the correct and transparent knowledge on volcanic risk. One of us commented on the lack of a serious confrontation among the interested parties.

From the collected documents we were particularly moved by an open letter from Prof. Pierluigi Fiorenza from the intermediate school Borrelli of Santa Maria La Carità. He is a perspicacious individual and we agreed with him that the fantastic nature of Vesuvius Evacuation Plan wants to be passed as the salvation for everybody. 'Doesn't it deal, instead, with a new apocalyptic chaos which is only capable to propose absurdity?' The professor did good in being sarcastic about the evacuation plan and thus identifying its grave deficiencies and a new business for those who will manage the catastrophe. These are some significant points in his letter:

1. It is not possible to evacuate 600 000 people in 15 days before a hypothetical eruption. Indeed, the persistently high level of seismicity is a clear sign of an eruption and would produce inoperable communication routes (trains, roads, highways). It would be impossible to move the people on the prey of panic with the escape routes out of use.
2. Civil Protection divided the territory into two areas: Red and yellow. Citizens of the red area, from Ercolano to Trecase, must abandon their homes, belongings, employment, and transfer for an indefinite period of time to distant places hundreds and hundreds of kilometers away. The heads of families, explains the evacuation plan, must move with cars their household goods and only later will be united with other members of the family. At the end of this operation the area will be enclosed and guarded by the military. On the other hand, the citizens of yellow area, from San Anastasia to Ottaviano, could conveniently remain in their homes because they have little to fear! And if the eruption happens to be plinian (the one that destroyed Pompeii, Herculaneum, Oplonti, and Stabia)? The yellow area will not be guarded by the order police. And if the 'red' citizens should decide to 'desert' and reach 'yellow' family members and friends?
3. Who will then assume the responsibility to decide that the eruption has ended and that the Vesuvians can come home? We should not forget that during the bradyseismic crisis of Pozzuoli[136] the Mayor did not want to sign any

document to evacuate, but as a simple precaution only invited the citizens to abandon their homes. All other authorities kept quite. Paradoxically, the emergency evacuation plan has not only blocked research, but also induced the population to sleep peacefully. The municipal administrations should wake up and assume their responsibilities, and those who promote mass exodus need to calculate the time of the operation and the massive national cost associated with it. The only solution possible at this time is, therefore, education toward a civil progress of the territory, with the schools and mass media playing a key role in this endeavor. These must educate and transmit the correct information onto the territory in order to reduce the risk. A vulnerable individual is more fearful and subject to rash decisions.

Two confronting cultures: risk management or prevention

By confronting Vesuvius Evacuation Plan, as elaborated by *Protezione Civile*, and VESUVIUS 2000, as elaborated by Prof. F. Dobran, we identified some fundamental differences between these two schemes of volcanic risk management as shown in Fig. 2.9. These differences are articulated in terms of modality, cultural position, solution of the problem, and consequence. We believe that it is just that a good sense of logic prevails when choosing any strategy, because this choice must always and exclusively reckon with the security of Vesuvians and conservation of their ancient culture.

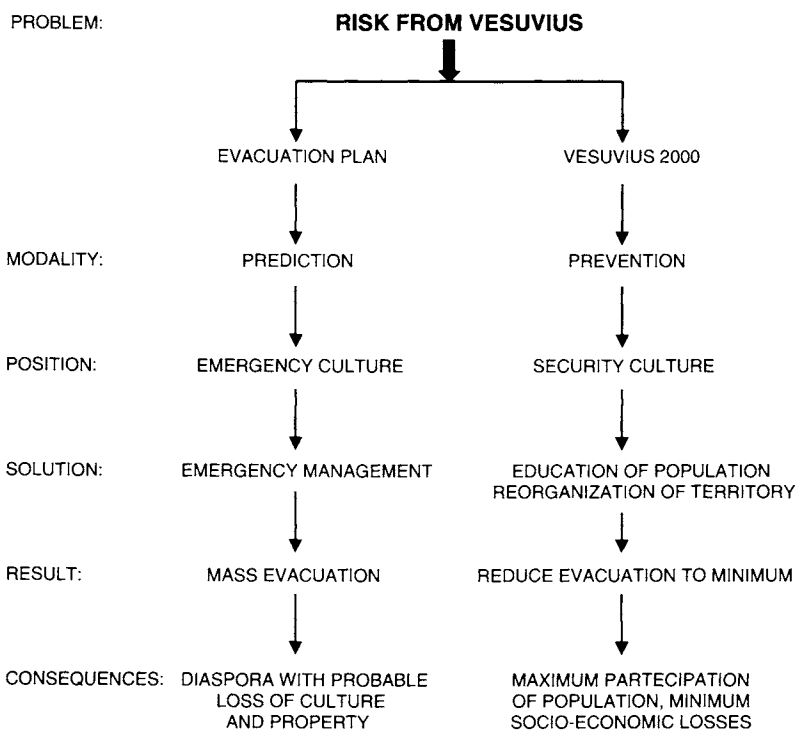

Fig. 2.9. Comparison of Vesuvius Evacuation Plan and VESUVIUS 2000, produced by the secondary school students of Luigi Sturzo of Castellammare di Stabia during the school years 1997–1999.

C. Conclusion

The volcanic risk mitigation study conducted by the students of Luigi Sturzo concludes with a clear comparison between different strategies. The report ends with a rather complete bibliography of pertinent works[137] and with two poems of Paolo Schettino. In these poems, Paolo brings out the delusion of how little has been accomplished to inform the people about the risk from future eruptions, and how the quiescence of the volcano makes people forget about its destructive power with the capacity of producing a gigantic catastrophe in the Vesuvius area. These are Paolo's poems.

Sperammo ca quaccuno ce sente

Primma quaccuno diceva
ca era inutile,
quaccuno addirittura diceva:
'Ma chi v' "o ffà fa"?'

E pure nuje stammo ancora ccà
e nun ce vulimmo capacità
'e ce arrènnere
pecché quanno succedarrà 'sta disgrazzia
a nisciuna parte ce putimmo appennere.

E sperammo ca quaccuno ce sente!

E nun sulo cu 'e rrecchie,
ma pure cu 'a capa.
Pecchè sulo accussì ce putimmo salvà,
sulo cu 'a bbona vuluntà

Stateve accorte

Quanno t'affacce 'a fenestra
e vide 'stu spettaculo ca Napule te dà
dice: < <Comme so ffurtunato 'a stà ccà! > >
e quanno vide 'sta muntagna te ne annamure
e t' 'a ricuorde pure si a Napule e mancà.

Ma nun saje,
nun può sapè
'stu gigante
che tene dint' 'o core
e chello ca nu juorno te pò ffà.

Pirciò, a tutte quante,
stateve accorte a 'stu 'mbruglione
ca 'nganna 'o core nuostro
cu parole doce e cu tante smangerie,
pecchè sulo isso sape chello ca vo di
e quanno 'o ddice, 'o ddice bbuono
ca tutte quante hanna sentì.

Hopefully someone here is listening

It was said before
not to be preoccupied,
someone even said:
'Who told you to be preoccupied?'

But we are still here
and we don't have the will
to comprehend the gravity of the situation
because when the calamity occurs
we don't know to whom to turn to.

We hope that someone is listening to us!

And not only with the ears,
but also with the head.
Because only like this can we be saved,
only with good will.

Be attentive

When you look out the window
and see the enchanting spectacle of Naples
you say: 'How fortunate am I to live here!'
and when you see that mountain you fall in love with
and remember it even if you are far from Naples.

But you don't know,
can't know
what this giant hides
inside its heart
and what one day can do to you.

To all,
watch out for this cheater
that cheats our hearts
with sweet words and many affectations,
because it only knows what it wants to say
and when it speaks it speaks with conviction
that all can understand.

Strillanno forte diciarrà:	Shouting it will declare:
<<Sò tturnato, stongo ccà!	'I returned, I am here!
Vuje crediveve che ero muorto,	You thought that I was dead
e invece so' vivo!	but I am alive!
E mmò, pruvate a me fermà! > >	And just try to stop me!'
E tanno chi 'o pò fermà?	Who can now stop it?
'Sta forza chi ci 'a dà?	Who will give us this force?
Pirciò, stateve accorte	Be thus attentive
'a stu gigante	of this giant
e nun ve facite 'mbruglià,	and don't be deceived,
pecchè pe colpa soja	because of its fault
sta città	this city
'na brutta fine 'a pò ffà.	may succumb to a dreadful end.

D. Evaluation

The experiences of students on the project consolidated their acquired scientific knowledge by making them more active and aware that each individual is a protagonist of his life and thus that nothing concerned with this life should be fully entrusted to others. This project, notes Prof. Mascolo, also produced a great satisfaction for her, because the students grew with the project, from a passive interest to an active involvement.

2.6. EDUCATION OF ADULTS

2.6.1. Volcanic risk survey and GVES

Too many students have graduated from Vesuvius area schools without learning even the basic facts about the volcano and this lack of knowledge is reflected among the lay people and their representatives at the municipal, provincial, and regional governments. In 1990s my colleagues and I conducted a survey[138] of several thousand adults from San Giorgio to Pompei and asked them some simple questions about their environment. These include 'What is Vesuvius?' and 'Where would you prefer to live?' Most people responded that Vesuvius is an active volcano and that it contains lava and gas. They rarely climbed on the mountain, but know that it destroyed San Sebastiano al Vesuvio in 1944. A significant number of them believe that Herculaneum and Pompeii were destroyed by this eruption. About a third of those surveyed think that Vesuvius will give them several weeks of notice before it erupts, while the rest believe that this warning will come in days, hours, and even suddenly. People are afraid of gas, earthquakes, and, what is very significant, that they will not be able to escape in an emergency because of non-functioning communication and transportation systems, and of the resulting panic which will develop all over the territory. People do not know what to do: Leave immediately, wait for instructions, or search for family members. The young prefer to leave for Naples, whereas the adults in the direction opposite to the direction of the dispersal of eruption clouds. About 80% of those surveyed think that they are uninformed about Vesuvius and want that a better future be created where they live and not somewhere else.

I have given seminars to thousands of students and adults all over the Vesuvius area.[139] Many are aware of the existence of Vesuvius Evacuation Plan because this has been politicized through the mass media, but they are not familiar with its details. People are aware that one day they will have to escape, but refuse to deal with this prospect today. This is disturbing, for it demonstrates a failure on the part of those who govern to keep the population informed and on the part of those who are being governed for not taking control of their lives through their representatives. Negative habits of mind have produced this situation, and a massive education on all levels of the society is the only means out of the closing-in inferno.[140]

Through GVES my colleagues and I have been promoting the objectives of VESUVIUS 2000, and education in particular. Some of these activities include the production of a video involving computer simulations of large- and medium-scale eruptions of Vesuvius, publication of newsletters and educational books, organization of seminars for adults and exhibitions for school children, presentations of VESUVIUS 2000 objectives at professional meetings, and organization of scientific meetings.[141] Fig. 2.10(a–d) illustrates some moments from our educational activities on the territory.

2.6.2. MCE-GTV, Prometeo, Sportello Informativo sul Vesuvio

Movimento di Educazione Educativa (MCE) is a national association of teachers and was founded in 1951. MCE is organized into territorial groups and in the Vesuvius area operates since 1970s as *Gruppo Territoriale Vesuviano* (GTV). In the past, this group promoted youth projects in collaboration with *Osservatorio Vesuviano* and hosted teacher formation courses. Its primary goals are to promote education on Vesuvius and pursue innovative educational methodologies. GTV is now coordinating *Laboratorio Regionale Città dei Bambini e delle Bambine* situated in San Giorgio a Cremano.

This laboratory was born in 1994 in San Giorgio a Cremano under the leadership of its Mayor Aldo Vella. This is a laboratory where 'a child is the central subject of a project of the transformation of the territory and thus mitigation of risk. The child can be responsible for all of the diversity, because that what is livable for him is more livable for the adults who are stronger. If listened to very attentively, the suggestions from children represent a formidable instrument in the hands of the adults, and it is therefore not by chance that the laboratory has been educating in the direction of legality, cohabitation with the volcano, and projected participation'.[142] The laboratory is headed by Arturo Montrone and Francesco Langella.

Prometeo is another cultural association which operates in Torre del Greco since 1994. Its members promote a greater Vesuvius consciousness, sponsor public debates, and furnish information on volcanic risk mitigation to the public through the project VESUVINFORM.

In January 2003 the Executive Committee of the Government of Torre del Greco, headed by its Mayor Valerio Ciavolino, passed a law for the creation of Information Window on Vesuvius (*Sportello Informativo sul Vesuvio*). Its function is to '... furnish information to the citizens on the problems of Vesuvius in order to

Fig. 2.10a. Moments from the educational activities on the territory promoted through GVES. From top left in clockwise direction: Flavio Dobran with Arianna Montrone at Granatello of Portici with the boat Giobe in the background, 24 August 1995; VESUVIUS 2000 exhibition at Villa Campolieto, 16 December 1995; teachers Linda Rosi from S.M.S. Diego Colamarino, Torre del Greco, and Anna Ibello from S.M.S. Don Milani, Portici, with their students presenting works on Vesuvius, 31 October 1997; primary, intermediate, and secondary school students participating at the exhibition held at Museo Nazionale Ferroviario di Pietrarsa, 16 December 1997, Portici; Flavio Dobran with students and teachers of Liceo Plinio Seniore of Castellamare di Stabia on Vesuvius, 3 November 1997. Colour version (see colour plate section in the Prelims).

avoid spreading false alarms'.[143] This is the first instance that such an office has been created by a municipality of the Vesuvius area for the sole purpose of helping its citizens become more familiar with the physical aspects of the territory and its history which have been shaped by man and nature alike. The Information Window is in effect a point of referral on Vesuvius, with the goals of reducing the anxieties of the citizens about the volcano and serving as a source of local information

Fig. 2.10b. Moments from the educational activities on the territory promoted through GVES. From top left in clockwise direction: Flavio Dobran with Alan Alda from Scientific American Froniers, filming on Vesuvius, August 2004; with Giuseppe Luongo, with Vesuvius in the background, c. 1997; with Anna Ibello and Annnamaria Trotta at an exibition at San Sebastiano al Vesuvio, 17 May 1998; with Giorgio Formicola above the crater of Vesuvius, 25 June 1998; with Pina, Luigi, and Massimo D'Anniello in Boscotrecase, 5 May 1999; with organizers of the 1998 student exibition at Museo Nazionale Ferroviario di Pietrarsa. Colour version (see colour plate section in the Prelims).

to students working on projects, schools pursuing volcanic risk education, professional organizations, businesses, etc. It recently collaborated with Istituto Comprensivo Statale d'Assisi on the project *Laboratorio di Vulcanologia*, Istituto Tecnico Commerciale e per Geometri Eugenio Pantaleo, and Circolo Don Bosci, all from Torre del Greco. The Information Window on Vesuvius is headed by Gennaro Di Donna and is under the supervision of Giuseppe Sbarra who heads *Ufficio di Informazione del Comune di Torre del Greco*.

Fig. 2.10c. Moments from the educational activities on the territory promoted through GVES. From top left in clockwise direction: Flavio Dobran with Associazione FIDAPA members, Gragnano, 9 January 2003; with students and teachers of Liceo Scientifico Don Milani, Gragnano, 7 January 2003; receiving an award from the secondary school Liceo Clasico de Bottis, Torre del Greco, 22 January 2004; with students and teachers of secondary school Istituto Tecnico Commerciale P. Levi, Portici, 21 January 2004; students and teachers of secondary school Luigi Sturzo, Castellammare di Stabia, 2004. Colour version (see colour plate section in the Prelims).

2.6.3. From possible cohabitation to planned participation

As a retired schoolteacher, Tullio Pucci still devotes considerable time to the educational initiatives on the territory and actively collaborates with many local cultural organizations. He is one of many Vesuvians for whom the volcano evokes a unique sense of belonging, where man and nature form an inseparable relationship. For Pucci, the complexity of the problem is such that this cannot be solved by the

Fig. 2.10d. Moments from the educational activities on the territory promoted through GVES. From top left in clockwise direction: VESUVIUS 2000 forum 2004, Villa Campolieto, 2-3 September 2004; Valerio di Donna lecturing; Ida Mascolo, Flavio Dobran, Gelsomina Sorrentino, Antonio Nisida, Arturo Montrone, Leandro Limoccia, Pietro Sarnacchiaro; forum participants in front of the Marine gate at Pompeii, with Tullio Pucci wearing a white hat; forum participants; in the group picture some individuals in the front row are Gennaro di Donna, Vincenzo de'Novellis, Giuseppe Luongo, Concetina Nunziata, and Annamaria Scorza; Annamaria Imperatrice and Flavio Dobran at the forum of Pompeii, with Vesuvius and forum participants in the backgroud. Colour version (see colour plate section in the Prelims).

present generation alone. Vesuvius must become an integrating background of a complex reorganization of the territory. The educational method cannot be that of an authoritarian indoctrination or the campaigns of generic information on risk, because there isn't a single Vesuvian who doesn't know that Vesuvius can explode. The educational approach must traverse one's emotional state in order to arrive at cognition and at the level that is superior to consciousness.[144] Fear shared by many, writes Pucci, is diffused among many and makes one having less fear than if one were confronting alone the same fearful situation. Pucci sees presence, memory, knowledge, and cohabitation as the key elements of a suitable educational scheme on Vesuvius.

The 'presence' signifies that each Vesuvian must bring out and give form to the volcano, whether in an imagined, loved, hated, or fearful sense. This will allow for passing from a subjective to an objective presence of the volcano, and by collecting all individual diversities it is then possible to produce a real sense of presence that belongs to everybody, because it is a part of everyone. The 'memory' is an emotional appropriation of roots; that which belongs to a history and to a territory. For example, the ruins of Pompeii attach emotions because they bring to life a memory of human presence which we can almost touch and experience. And it is such a state that the Vesuvians must experience in order to bring to light the 'Vesuvius consciousness'. The 'knowledge' can then be deepened in various ways: From science to history, but first of all through a close encounter with the volcano, its lavas, its forests, its vital heartbeats. This educational approach, Pucci concludes, leads to the cohabitation, or better, to an easier and more mature coexistence of those who choose to stay on the territory and reorganize the environment into a sustainable community.[144]

2.6.4. Technology education

2.6.4.1. Technology

Technology is the process by which people modify nature to meet their needs and fulfill their desires. For most people, however, technology is measured in terms of tangible products such as computers, cell phones, automobiles, aircrafts, bridges, skyscrapers, to name a few. But technology is more than products; it also includes knowledge and processes used to create and operate the artifacts; transportation systems used to move raw materials, finished products, and people; infrastructure systems necessary for the design, manufacture, operation, and repair of technological products; health care and business systems used by humans to maintain healthy and productive social and cultural environments.[145] Both science and engineering contribute to technology: The former by using the accumulated knowledge over time and the scientific inquiry that generates knowledge about the real world, and the latter because it uses knowledge of the design and processes of solving problems. Innovation is the transformation of ideas into new and useful products and processes, and thus is also a part of or closely related to technology.

A safe and prosperous environment for Vesuvians cannot be produced until political decision-makers and people themselves become aware how technology can shape their future. Escape routes, systems which stop or divert lava and pyroclastic flows, or safe habitat(s) cannot be built without city planners, architects,

environmentalists, and civil, electrical and mechanical engineers with their knowledge base, capabilities, and imaginations. The geologists can contribute toward this process by supplying their knowledge about the volcano, but not to the extent of technologists who have the means of creating a survivable and livable environment for the people of the Vesuvius area. But this is hardly realized by the administrators and people of the territory, since they are placing their lives into the hands of those who are as blind as they are. This is a tragedy that will persist until it is realized that technology alone, and not the geologists or geophysicists, can protect the Vesuvians from future eruptions and preserve their culture. In a democratic society, the citizens need technological tools to participate intelligently in decision-making, while the people's representatives in local and national governments, businesses, and media need them to make or influence decisions that affect many others. Without having confidence in their abilities to ask questions or think critically about technological developments, the public can hardly participate in shaping its future and is left on the mercy of autocrats.

2.6.4.2. Technological literacy

We use technology every day, but very few of us know how the information is transmitted when we click on a mouse or make a phone call, what happens when we push a gas pedal of an automobile, or even how to replace or reset an electrical fuse in our homes. Many of us are in effect technologically illiterate and thus fail to realize the implications. Technological literacy can be measured in terms of three closely related things: Knowledge, ways of thinking and acting, and capabilities[146] (Fig. 2.11). These three dimensions are interrelated, for an individual with technological capability also knows something about the working of the technology and thinking and acting technologically, or a person who can think about technology also has some knowledge of science and engineering that define technology. Every technologically literate person has a unique combination of these three elements of technology, which are determined by his formal education, work that he does, his life experience, and his society and culture. This literacy moreover changes with time as new demands are being placed by the changing environment.

Technologically literate individuals are familiar with basic concepts of technology. One such concept is the system, or components that work together to produce the desired function. A system can be a car, a computer, a volcano, a volcano and people surrounding it, escape routes, and so an, and it can thus be simple or complex, or local or distributed with many interrelated components. Another concept is the technological design process. This includes certain criteria with various constraints, such as time constraints and financial limits, methods and degrees of protection of human or natural habitats, or priorities in protecting human patrimony. All designs involve tradeoffs and sometimes these can produce undesirable or unwanted consequences. Automobiles, for example, have created a more mobile society, but also air pollution. Technology thus influences changes in society and has allowed humans to go from the Stone Age, to the Bronze Age, to the Iron Age, to the Industrial Age, and most recently to the Information Age. And what the

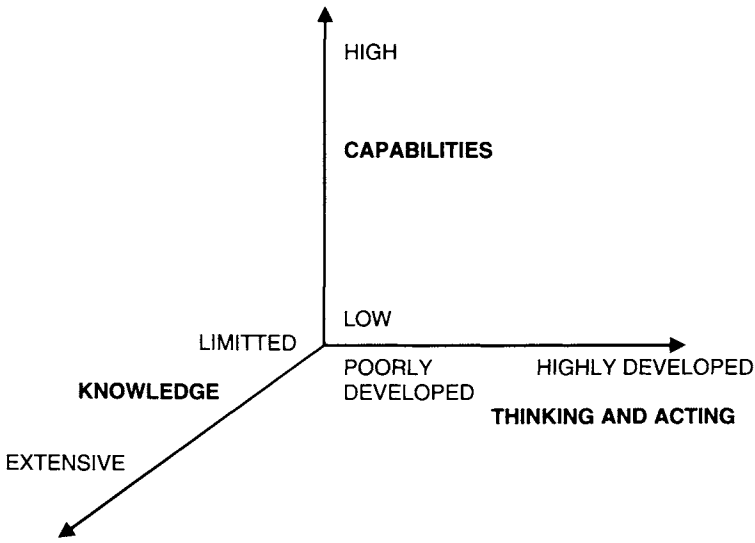

Fig. 2.11. Three dimensions of technological literacy include knowledge, thinking and acting, and capabilities.

Vesuvians need to do in the twenty-first century is to bring about the Protection and Prosperity Age to their territory. They need to recognize that society shapes technology as technology shapes society. All technologies have both costs and benefits, and technologically literate people should know how to weigh properly one against the other. The Vesuvians should, therefore, be able to weigh pros and cons of evacuation plans that promote emergency culture against VESUVIUS 2000 that promotes security and prosperity. Both of these choices can be quantified in terms of costs and levels of protection of humans, territory, and culture. Technologically literate Vesuvians should be able to weigh these factors and understand how the technology can be made to reflect the values of their culture. Past generations of Vesuvians have helped shape the Western Civilization and it is the duty of present and future generations to continue in this tradition.

The purpose of technology education is to teach individuals about technology. This is not the same as educational technology which is the use of technology to help people learn more about a subject they are studying. Technological literacy is also not the same as technical competency, for the former is the capacity to understand the broader technological world rather than an ability to deal with this world in small pieces. An expert in a certain field may know how a particular part of the system works, but to be able to comprehend a complex system with social, political, or cultural dimensions is another story. For example, the architects of Vesuvius Evacuation Plan[147] may be good naturalists, but they are not competent technologists because their plan is unreliable from the engineering, social, and cultural perspectives.[148] And if the Vesuvians were technologically literate they would not have permitted their representatives to hide behind such a plan which is only producing scientific and cultural damages. Technologically literate Vesuvians would

ask pertinent questions regarding the evacuation plan's benefits, risks and tradeoffs, seek more actively information about alternate technologies (VESUVIUS 2000), and participate proactively in the choices of their representatives. With a higher level of technological literacy in the Vesuvius area, the people in position of power would manage the volcanic risk in a manner that maximizes the benefits to the public, rather than special interest groups. The population would understand that science and technology are the foundation of economic growth and that by supporting VESUVIUS 2000 would bring about this growth. Any literacy empowers people and gives them tools to take a better advantage of the changes around them.

2.6.4.3. Educating for VESUVIUS 2000

VESUVIUS 2000 is an interdisciplinary feasibility study for the Vesuvius area that aims to produce a safe and prosperous habitat for about 1 million people around the volcano.[149] This requires establishing safe areas around Vesuvius and creating new urban plans and city designs where the majority of the people can be resettled and prosper with the establishment of new economic opportunities. The realization of this extraordinarily complex technological project requires supports from local, national, and European Union governments. Such a volcanic risk mitigation project is a far cry from simple-minded evacuation plans and requires a high degree of technological literacy on the part of people's representatives in order to support its objectives. Our technological tools increased slowly until the eighteenth century and then by the end of the nineteenth century we had locomotives, steamboats, telegraph, telephone, transcontinental railroad, internal combustion engine, suspension bridges, automobiles, and many other artifacts that we now take for granted but were seen then as being miracles of the age. By the end of the twentieth century we added another panoply of artifacts to our disposal: Nuclear power, aircraft, voyages to the Moon, genetically modified foods, artificial implants, computers, and cell phones, to name a few. Many of us use some of these artifacts without even knowing how they work and why, because most modern technologies are designed so that the users do not have to know how they work. And yet, we are confronted with the Vesuvius problem and with the ignorance that is preventing the modern technology from being used for the benefit of Vesuvians.

We have a misconception in the Vesuvius area in that the technological change is disconnected from the human influence. Those who 'manage' the risk in this area apparently believe that the technology has little if any input from them, or that the technology affects the society; they believe that the technology follows its own course. 'If we perceive technology through the lens of [this] technological determinism, we cannot weight the risks or costs associated with a technology or its benefits';[150] we cannot judge between evacuation plans that promote emergency culture and VESUVIUS 2000 that promotes security culture. In almost every situation a technology can be advantageous for some and disadvantageous for others, and if we cannot weigh properly these options we cannot use technology for our benefits. The Vesuvians must, therefore, give a careful consideration of possible advantages and disadvantages of different volcanic risk mitigation strategies, for even a perfectly sensible choice can

lead to undesirable consequences. This is a difficult decision for many and requires very careful scrutiny of planners and designers and the public in particular.

How and where does one learn about technology? One should begin learning technology at a very early age (primary school) and then mature throughout the school years. This should be accomplished through the exposure to technological concepts and hands-on, design-related activities, where the student acquires knowledge, ways of thinking and acting, and capabilities that are consistent with technological literacy. Problem-solving and design approaches are useful for more mature students at the university level. Problem-solving requires the exercise of knowledge that is specific to the problem being solved and knowledge that transcends this problem or discipline. Design, on the other hand, requires new elements of materials and systems that relate to one another. Given all of these requirements and results based on incomplete surveys, the conclusion is disheartening: We value very little technological literacy and consequently even our best industrialized nations have not achieved it.[151] This is, of course, not to say that some technology is not being taught as a theme of other disciplines such as science, in formal technology education classes, in technical-career preparation programs, and in post-secondary educational environments. But for the majority of us who are out of school we can informally educate ourselves through the visits to museums and science centers, television, newspapers, technical magazines, and other media.

The available evidence suggests that public participation in technological decision-making can indeed influence policy-making.[152] A good example of the collaboration between legislators and public is the Boston Central Artery and Tunnel Project.[153] Its design stage had gone through the Environmental Impact Statement or feasibility study where it was widely circulated by the managers of the project and reviewed by public and environmental and business organizations, before the federal government granted billions of dollars for construction. This is what VESUVIUS 2000 intends to accomplish for Vesuvians, but the lack of technological literacy and foresight of risk managers prevents this from happening.

2.7. CONCLUSION

In our overview of education we have examined several educational ideas, kinds of understandings capable by our minds, and educational methods suitable for teaching primary, intermediate, and secondary school students in public schools. As an educational idea, socialization aims at preparing students to become good members of society: To respect its values and adopt to its norms. In the Platonic idea, education should not only involve producing good and effective citizens, but also having the students acquire that knowledge which gives them an increasingly abstract and rational view of reality. In the natural education of Rousseau, learning is focused on each student's ability to discover the natural world for himself, rather than on acquiring knowledge of civilization. These three educational ideas are, however, mutually incompatible, and what the schools have done is compromise between socialization, rigid academic program, and developing natural potential in each student.

As humans, we first adapt to language through mimetic skills or mimesis and slowly begin acquiring mythic understanding by forming images of reality based on such tools as binary opposites, fantasy, or rhythms. Gradually, the external culture of the society begins to work on students' psychological processes and this is how they begin to understand reality around them. As the children get older they begin to sense pressures from the world around them and tend to associate with the characters or things that transcend human experiences. This romantic association with the heroes and limits of reality is prevalent between the ages of 8 and 15, and the teachers should take advantage of this learning capability when devising school curricula. By the age of 15 or so the students begin to question the limits of reality and tend to investigate how and why the world around them works. With a proper supportive environment around them, the students of this age group can acquire philosophic understanding and the teaching process should include general schemes how things work or function and what are the limits of these schemes. The Industrial Revolution produced mass education and a progressivist view of utilitarian knowledge where the schools must promote effortless learning and prepare skilled workers for the new 'progressivist' society. Vygotsky informs us that the mind reaches its potential only when it interacts with the social and cultural elements of the real world environment and that it is the internalization of the external world that leads to one's development.

Primary, intermediate, and secondary school students should be, therefore, taught with the tools of mythic, romantic, and philosophic understanding, respectively, with the external cultural symbols playing a critical role in forming students' imaginations of real world objects and processes. In teaching students Vesuvius, we should capitalize on these cognitive tools by gradually mapping Vesuvius and its environment in students' imaginations from simple binary qualities to complex schemes that integrate science, technology, history, and economics, for the purpose of producing individuals capable of contributing to the safety and prosperity of the territory. For each age group of students, we defined a teaching methodology and presented several examples of the applicability of these methodologies in Vesuvius area schools.

There are several cultural organizations operating on the territory and promoting information and education on Vesuvius through schools and public seminars, students' exhibitions, and professional meetings. These organizations often collaborate and jointly are contributing to the creation of Vesuvius-conscious citizens. The Vesuvius area citizens of today are, however, poorly educated about the volcano, and what needs to be accomplished is to eliminate the fear and improve the socio-economic conditions of the people around the volcano. This requires Vesuvius consciousness and technological literacy, both of which are lacking on all levels of the society. With our plastic minds ready to internalize the external elements, and with correct, persistent, and widely distributed educational efforts, it is indeed possible to transcend the current culture of resignation and negative habits of minds and produce in several generations security-conscious Vesuvians. Only then will we begin to notice our potentials, provided, of course, that the volcano continues sleeping on.

NOTES

1. Donald (1993, p. 10). In his *Origins of Modern Mind*, Donald synthesizes a vast amount of data from anthropology, paleontology, linguistics, cognitive science, and neuropsychology into an account of major cognitive transitions of hominid history and how these transitions shaped the development of new forms of culture.
2. The most serious mental habits are patronage and conformity, for these promote inaction, complacency, and little recognition of abilities and worthy enterprises for the territory. Organized crime strives under these conditions and distances investors from the territory. The end result is social degradation with few prospects for achieving security and prosperity. For more details, see Chapter 1 (Dobran, 2006).
3. A security culture is fundamental for achieving the objectives of VESUVIUS 2000. This requires citizen awareness and participation, and working toward the creation of a sustainable habitat.
4. The most famous of all of the martyrs of the Vesuvius area is San Gennaro (Gleijeses, 1990, pp. 82–84). He was born as Januarius in Naples, sometimes during the second half of the third century from a noble family of Benevento. By the beginning of the fourth century Januarius was already a bishop of Benevento, and when in 303 the Roman emperor Diocletian issued an edict that ordered persecution of Christians Januarius disobeyed it by making a visit to an imprisoned deacon in Miseno. For this he was arrested and later condemned to dismemberment. On 19 September in *temporibus Diocletiani* (the years of Diocletian) and with several other deacons he was decapitated near Solfatara (a volcanic crater located in the Phlegraean Fields) and his blood saved in two ampules. When 10 years later the new Roman emperor Constantine abolished all religious persecutions, the legend says that the remains of Januarius were placed in catacombs (these are now called the Catacombs of San Gennaro and can be accessed from the Church Incoronata at Capodimonte) and that his blood liquefied for the first time. His remains were subsequently placed into the family tomb near Capodimonte with an inscription that they belong to the bishop Gennaro. With time his resting place became well known and many Neapolitans wanted to be buried in the volcanic tuff close to his tomb. Today, the relics of San Gennaro can be venerated in the Treasury Chapel of San Gennaro in the Cathedral of Naples.

As a saint, San Gennaro has been called upon to make miracles whenever the people of Naples and surrounding towns needed justifications for their actions. This may involve saving the people from pestilence, famine, erupting volcano, invaders, economic and social problems, etc. The miracle is called through a procession that exhibits his statue and blood, and if on this occasion his blood liquefies it is believed that the omens are good and that the miracle will be fulfilled. And each time that the miracle did not come about something tragic happened to Neapolitans: In 1527 a pest killed 60 000 people, in 1560 Turks invaded, in 1666 and 1764 famines stroke the city, in 1856 many perished from pestilence, in 1962 died the cardinal archbishop, and in 1968 the blood liquefied only a day later and everything turned out well for the protesting poor. In 1944 the inhabitants of San Giorgio a Cremano called upon the Saint to stop the lava flowing toward their city; the flow stopped but

invaded and destroyed completely the surrounding town of San Sebastiano al Vesuvio. Each year on the 19th of September the Neapolitans celebrate their saint in a procession that culminates with Naples' Cardinal displaying the blood ampules of San Gennaro, hoping that it liquefies.

5. Thomas Kuhn identifies a 'paradigm' as an achievement that attracts an enduring group of adherents away from competing modes of activity and being sufficiently open-ended leaves problems for the redefined group of practitioners to resolve. A 'paradigm shift' can produce a revolutionary change in the methods that a group uses as its tools of trade. The new tradition that emerges from the old one is not only incompatible but often 'incommensurable' with the old one. Incommensurability is a blindness or a 'barrier' to seeing what the other side is saying (Kuhn, 1996, pp. 10, 92, 103).

6. The history of modern Italy is objectively presented in Clark (1996) and Kesselman et al. (1997). See also Di Donna (2006). Here is a summary of this history.

The unification of Italy in 1870 produced a liberal country which after 50 years was replaced by fascism. World War II produced the death of fascism and Italy became a republic with a new constitution but old institutions. Forty years later, when the Cold War ended and Berlin Wall collapsed, the Italians found themselves again in difficulty and began debating about the Second Republic, while giving power to those who were excluded in governing the post-war First Republic. The adoption of a new constitution requires changing many institutions of liberal and fascist Italy, but the Italians are not yet ready to make such a dramatic transformation. This is unfortunate, however, for the heart of the Vesuvius problem is deeply rooted in these institutions.

Resurgence (*Risorgimento*) unified Italy, with Victor Emanuel II of Savoy as its first monarch, and produced a country with different regional societies, economies, cultures, and religious practices. The country had few skilled workers and its economy depended on the international prices of its products. About 60% of active population worked the land, 70% were illiterate, 98% were Catholics, and the suffrage was very limited. The north had better agricultural and industrial economies and developed more rapidly than the south (*Mezzogiorno*) because of its proximity to the more developed nations such as France and Switzerland, de-industrialization of the south in face of new competition and opportunities for migration, and neglect of the south by the state. The north was becoming more industrialized and the south more rural, in spite of very large land areas which were expropriated by the state from the ecclesiastic estates and sold through local councils to landowners, merchants, and lawyers who were usually the councils themselves. The south's *latifundias* (large landholdings) with their oppressive landlords were left intact and, in exchange for votes, free to pursue their own interests while the north was developing.

The largest city in Italy was Naples with about 500 000 inhabitants and about half of the country's population were women who also comprised half of the industrial workers. Most Italians could not understand or speak the language from another region until the state began creating a state-run school system which by 1911 decreased the national illiteracy level to about 40% and in Campania to about 55%. At the same time there were embarrassingly many universities, most of them teaching law

and medicine. There were only local and provincial newspapers. The national newspapers eventually emerged from political debates that were conducted in *caffès* or *circolos* by the middle-class society. Rural leisure interests focused on the traditional Church feast days, processions, and passion plays of the lives of patron saints, whereas the games, such as *pallone* and *bocce*, were widely played on Sundays. Free street entertainment was widely diffused in many towns, such as Naples where this tradition is still alive.

The state was run by the liberal Piedmontese or northern establishment whose ministers, deputies, civil servants, judges, and academics were often the same people who only traded posts among themselves. These individuals relied on personal contacts, on the old-boy network and Masonic links, and failed to train a successor establishment with technical abilities. The principal weakness of the top government was its unwillingness to make concessions at lower levels. Sixty-nine provinces were headed by Prefects who were appointed by the central government, and each province supervised municipalities (*comuni*) which had mayors (*sindaci*) that were appointed from council members. Although *comuni* exercised a very important role in education, public works, land distribution, and social and medical services, they were also chronically short of money, perhaps by a deliberate government policy to control them. Similar to local governments, the Chamber of Deputies, or Lower House of the Italian Parliament, was essentially the home of influence in domestic matters where *trasformismo* (building majority in parliament by winning over enough deputies irrespective of political affiliations) was fully practiced. The art of government thus shifted between buying deputies and buying votes, or creating and holding together a shifting coalition of support by persuasion and patronage. The southern government strongly depended on patronage (*clientelismo*), or personal relationships of obligation between the client individuals or families and their powerful protectors, patrons, and Mafia bosses who exploited peasants with the helping hand of local police (*carabinieri*) during riots. Peasant revolts were brutally suppressed. In reality, the Liberal Italy did not really exist and the loss of Naples' autonomy after the unification brought a strong economic decline in *Mezzogiorno*.

By the beginning of the twentieth century Italy experienced a significant economic growth, but not an Industrial Revolution. This growth was caused by the utilization of new techniques of Industrial Revolution for manufacturing industrial and textile products and a shift toward heavy industry. But by 1914 Italy was still an agricultural state, with its most important product cotton. Banks used foreign capital and techniques, contributed significantly toward the development of hydro-electric and steel industries, and the politics came to be dominated by a handful of giant firms, organized in trusts.

Italy was still not a nation-state by 1914. Forty percent of people were still illiterate and spoke only dialect, a popular press barely existed, there was no general broadcasting in spite of Marconi's invention of the wireless, there were too large social and economic gaps between north and south and between urban and rural areas, too many relied on income from family members abroad, the social welfare system did not work, and Italy was becoming a country of institutionalized or legally guaranteed

privilege. The Liberal State survived throughout the Great War, but its death came soon afterwards because of the poor politics of her statesmen in the midst of changes produced by the Great War. The liberal regime introduced universal male suffrage and a new electoral law which after the 1920 elections showed very strong Socialists and Popolari gains, and significant gains from Communists, Radicals, and Fascists.

The National Fascist Party (*Partito Nazionale Fascista*) was found in 1921 and by 1922 gave its *Duce* (leader) Mussolini a real political base. It consisted of fiercely independent and different para-military groups recruiting from the urban middle class and small owners. These were run by local bosses who were intransigent and increasingly a menace to the public order as well as to the Socialists and their organized unions. By 1924 Mussolini not only succeeded in bringing various fascist factions under control and making the Fascism 'respectable' and parliamentary, but also destroyed and discredited the main opposition parties and won others to his cause. The Catholic Church was the greatest obstacle to the regime and had to be integrated in 1929 when Mussolini signed the Lateran Pacts. These pacts set up a separate sovereign state of Vatican City, provided a financial compensation for the loss of Church's pre-1870 territories, brought religious education in primary and intermediate schools, and Fascists obtained recognition from the ecclesiastic authorities. Although the Church supported the Fascist wars in Africa and Spain and anti-Semitism, she also played a very important role in defining future Italian politics by training a Catholic student movement with the objective of preventing Fascist monopoly of student elite. This bore fruit after World War II when the members of this organization (Aldo Moro, Giulio Andreotti, Francesco Cossiga, and others) led the post-war Italian nation. A new Catholic ruling class was therefore being formed as the Church embarked on reconquering the Italian society.

When *Duce* joined Germany and Japan in an alliance on 28 May 1940 he was convinced of German invincibility and could not seat around while the map of Europe was being redrawn. The Vesuvius area first experienced World War II from British bombers on 1 November 1940. The raid did not produce much damage, but a great deal of fear. When the United States entered the war the things changed, however. Over 100 bombing raids over Naples and vicinity had in 4 years produced more than 25000 deaths and immense destruction (D'Ambrosio, 1995). But in 1943 Italy managed to come to the side of the winners by getting rid of Mussolini and Fascism, after nearly 300000 Italians lost their lives in the war. By 1946 the anti-Fascist parties established a Republic and by 1948 Italy had a new constitution.

The Republican Italy was governed by a new conservative regime made of Christian Democrats (*Democrazia Cristiana*) and a parliament of local government similar to that of the nineteenth century (Caciagli and Kertzer, 1996). It also practiced the politics of compromise and patronage, and of granting favors and buying support. The Italian Resistance movement carried an enormous post-war prestige for it liberated the north from Fascism and set the stage for a new post-Fascist Italian constitution based on a multi-party system. Vatican also played an important role, for through the Catholic Action reached thousands of Catholic lay organizations and united them into the Christian Democratic Party. In order to stay in power without

being a major party, the Christian Democrats had to bypass the inherited, slow-moving, and inefficient civil service dominated by the southerners by inventing a system of special agencies to run welfare services and large sectors of the economy.

France, Germany, Belgium, Luxembourg, the Netherlands, and Italy formed the European Economic Community (the Common Market) in 1957 for the purpose of eliminating tariff barriers or integrating economies. During the following years, other European nations joined the Community and in 1981 European Parliament was elected. With the Maastricht Treaty, European Union made plans to establish a central currency and in 1999 formed a central bank with *euro* as the currency. The present members of the Union have over 300 million people and a combined gross national product close to that of the United States.

The civil service, which in pre-Fascist times had been small and northern, became big and southern, creating a hostility between northern ruling politicians and permanent southern administrators. In 1950s the civil service could be bypassed by the agencies, but in 1970s it was much more difficulty to do this, as Christian Democrats became weaker and deprived of abundant resources. An important legacy of Christian Democrats remains the huge fund for the south which aimed at industrializing the south, but producing instead a post-industrial south. This state-financed program of about 6 billion *euros* (bitterly opposed by northern industrialists) called upon the state-owned firms to direct 60% of their new manufacturing investment and 40% of their total investment to the south. This led to the construction of large capital-intensive industrial complexes which unfortunately managed to produce too few jobs for the southerners who had to emigrate to northern towns, Europe, and Argentina in search for these jobs. As it turned out, it was not the industrialization which improved the life of southerners, but 4 million or about 10% of emigrants who were able to send relief back home, eradication of malaria in the late 1940s, better transportation, and massive welfare. The south had acquired a modern economy, but not a modern southern work force with the ability to run the economy and produce the growth of small businesses for the purpose of creating new jobs.

By the turn of the twentieth century Italy became the world's fifth industrial power, but still had weakness in practicing the patronage and subsidy in public sector, unworkable health care, unreformed pensions, and malfunctioning communication systems. Government spending was also too high, which after the European recession of early 1990s required enacting tough new measures to cut spending, freeze wages, and increase taxes. For Italy these were difficult times as she now had to be led by the governments of technicians, consisting of the former Treasury Minister Giuliano Amato (1992–1993) and former Governor of the Bank of Italy Carlo Azeglio Ciampi (1993–1994) under whom a reform of the electoral law took place. Italy could not anymore even meet the monetary criteria of the Maastricht Treaty and in 1993 she left the European Monetary System. In 1998 she qualified, however, to enter into *euro* that began in January 1999.

When the post-World War II regime based on Christian Democratic practices and values collapsed in 1992–1993, the future of the First Republic began to be questioned. Old parties could no longer provide jobs, parliament lost a great deal of its

legitimacy, the challenge from the League with its threat of federalism, the institutions, already with little prestige, lost even more, and the anti-Fascist and anti-communist foundation of post-De Gasperi governments had been undermined. Despite changes in the electoral law, the new party system continues to remain fragmented. Italy also has to adjust to the rules of the European Union, begin dealing with foreign immigration, and control new forces in the north and old ones in the south if she wants to remain united.

The most important Italian divisions are regional. Red areas are not located in the industrial heartland of the northwest, but in the central regions of Tuscany, Emilia-Romagna, and Umbria. On the other hand, the Church and religion are most deeply rooted in Veneto and Lombardy. The northern League is an outgrowth of several leagues from northeast and center that were united with the strongest, the Lombard League. The biggest regional division is, however, between the north and the south, where the south has a distorted class of social structures that has rendered southern policies vulnerable to patronage networks. In 78 provinces there are about 8100 municipalities or *comuni* whose mayors, until recently, could not be directly elected by the people. Since the electoral law of 1993, the towns with more than 15000 inhabitants can elect their mayors directly and their parties can receive 60% of the seats on city councils. Before the regional reforms, *comuni* were often controlled by the prefects who instituted and dissolved *giunte* (cabinets), but after the reforms the municipalities are over-sighted through the committees working with prefects. Under the second Berlusconi government (2001–2006), both the local and regional governments in Campania are governed by the Center-Left opposition parties and its attempted reforms of institutions are bitterly contested.

7. We will have more to say about these educational methods shortly.
8. Egan (1997, pp. 3, 10).
9. Durkheim (2002, p. 12). Durkheim in his turn of the nineteenth-century lectures at Bordeaux and Sorbonne outlined his vision of moral education. Morality, he declares, 'consists of a system of rules of action that predetermine conduct' (p. 24). The fundamental element of morality is the 'spirit of discipline' (p. 31) and the second element is 'attachment to social groups' (p. 64 ff). Discipline imposes a restraint on the child's behavior; it sets limits to his desires and goals of his activity, and sets the condition of happiness and of moral health (pp. 43, 44). This places the child in harmony with the physical environment and social world, for society is the 'normal goal of moral conduct' (p. 60) and a combination of elements that transcend the individual characteristics of its members. The child must therefore attach to social groups to experience the moral characteristics of the society (p. 65).
10. Ibid., p. 124.
11. Ibid., pp. 134, 143.
12. Ibid., p. 167.
13. Ibid., p. 233.
14. The *Republic* of Plato (1992) is thought to be written c. 380 B.C. and when reading it, it is important to understand the times when it was written. Plato was only a year old when the great Athenian statesman Pericles (495?–429 B.C.) died. During this 'Periclean Age' (also called 'Golden Age of Pericles', 'Golden Age of

Athens', or 'Age of the Greek Enlightenment'), the philosophers Anaxagoras (500?–428 B.C.), Protagoras (481?–411? B.C.), Empedocles (490?–430? B.C.), and Socrates (469?–399 B.C.) were exploring and teaching the 'truth'; Hippocrates of Cos (460?–377? B.C.) tried to teach medicine; Sophocles (496?–406 B.C.) and Euripides (480?–406? B.C.) wrote tragic poetry and drama *Antigone* and *Medea*; and the Athenians built on a hill the Acropolis. And then the plague and the Peloponnesian War (431–405 B.C.) resulted in the conquest by Sparta and Athens was stripped of her fleet, fortifications, and democracy. When in 404 B.C. Plato was only 24 he saw Athens as a conquered city, with the Periclean Age brought down to her knees, even though the Spartans never repressed or enslaved the Athenians or imposed their military way of life on them. And 5 years later, in 399 B.C., when Socrates was convicted of instigating the Athenian youth against the state and made to take the poisonous hemlock, Plato could never forgive this state and in his utopias hardly ever permit the freedom of speech. Plato's hero could not plead the principle of free speech in his defense, because this privilege belonged only to the enlightened few and not to benighted many that could have produced a victory for the Athenian democracy in which Socrates did not believe. In his scholarly work *The Trial of Socrates,* Stone (1988) states: 'This was Socrates' triumph and Plato's masterpiece. Socrates needed the hemlock, as Jesus needed the Crucifixion, to fulfill a mission. The mission left a stain forever on democracy. That remains Athens' tragic crime'.

15. Plato (1992, p. 178, 505a).
16. Ibid., p. 211, 540a.
17. Rousseau (1956, p. 5). Rousseau's *Emile* was published in 1762 and shortly thereafter was ordered burned in Paris and Geneva. And yet it survived and endured ever since, because it exerted a great influence on the course of educational thought and practice. The book deals with the education of a French boy named Emile, from infancy, to boyhood, through teens before and after puberty, and ending with marriage and manhood. Through Emile, Rousseau championed individualism in education, but in other books such as *The Social Contract* (Rousseau, 1968) he saw the need for an acceptable national education that is complementary to the tutorial system advocated in *Emile*. As any other book, *Emile* too needs to be placed into the times when it was written; when the mass education was not yet established as a state-supported enterprise.
18. Voltaire (1966), Diderot and d'Alembert (1751–1772).
19. Dewey (1981, p. 444–445).
20. Egan (1997, p. 20).
21. Dewey (1981, p. 488).
22. Donald (1993, p. 98).
23. I relied on Donald (1993, Chapters 4–6) for this summary.
24. Donald (1993, p. 168).
25. Ibid., pp. 119, 122.
26. Ibid., pp. 202–212.
27. Ibid., p. 215.
28. Gregory (1981).
29. Donald (1993, p. 268).

30. Vygotsky (1978, p. 52). Lev S. Vygotsky was a Russian psychologist of the first half of the twentieth century who explored the phenomena of memory, speech, play, learning, and education of children. His stimulating writings are still attracting cognitive psychologists and educators as reflected by the number of books that deal with Vygotsky's method. For recent developments in language and memory, see Cognition and Behavior (2004) and Evolution of Language (2004).
31. Vygotsky (1978, p. 55).
32. Ibid., pp. 57, 128.
33. Ibid., p. 93.
34. Egan (1997, p. 36).
35. Yoke (2000, p. 11).
36. Ogden (1976, p. 20).
37. Friedrich Nietzsche (1844–1900) was a Prussian philosopher and much of his thought is devoted to working out the consequences of the loss of absolutes (Cahn, 1995, pp. 1247–1270).
38. Brown (1991).
39. Aristotle (Rhetoric, 1410b).
40. For creation myths around the world, see Sproul (1991). For Greek and Roman mythology, see Hamilton (1989).
41. Egan (1997, pp. 67–68).
42. Vygotsky (1978, p. 87).
43. Ibid., p. 89.
44. Ibid., pp. 81–83.
45. The great Roman statesman, orator, and author Marcus Tullius Cicero (106–43 B.C.) called Herodotos 'patrem historiae' (the father of history). Herodotos (c. 484–426 B.C.) was born at Halicarnassos in Caria in the southwest corner of Asia Minor. He traveled extensively in Egypt, Middle East, and Black Sea, and although he was not the first to write history he was the first, however, to write the first masterpiece of Greek prose. Herodotos' *Histories* (Herodotus, 1996) is an account of the gigantic conflict between Asia and Greece, from the time of Croisos (King of Lydia, 560–546 B.C.) to that of Xerxes and the end of the Persian Wars in 478 B.C. when the independence of Greece was secured. He wrote his *logos* (story or history) by witnessing many episodes of the conflict between Persia and Greece, and described both sides objectively, depending on oral tradition, and speaking through the witnesses. *Histories* is full of Greek and Near Eastern folklore, and is comparable to the books of great travelers such as Marco Polo. Herodotos is candid, prudent, and frequently indulging in picturesque details, and because he was on the mercy of dragomans his accounts are less accurate than we would expect today of a similar book. The glory of Herodotos lies in his description of men and different nations and of their manners and customs: How man solve their problems, feed themselves, what kind of garments they make and wear, what kind of houses do they build, their sexual habits and family connections, why do they behave as they do, how they pass from childhood to adolescence, from celibacy to marriage, from manhood to old age, how do they dispose of the dead, and so on. As Sarton remarks: Herodotos 'may not be the father of history, but he is certainly the father

of ethnology' (Sarton, 1993, p. 312). *Histories* is in effect an engrossing romantic novel based on real-life events.

46. Ong (1971, p. 255).
47. Egan (1997, p. 93).
48. *Rediscovery of Herculaneum and Pompeii, Grand Tour, William Hamilton*

Rediscovery of Herculaneum and Pompeii

In 79 A.D. the 24th of August was an official holiday celebrating the birthday of the deified emperor Augustus and, ironically, the day after the feast of Vulcan, the Roman God of Fire. The Gods could not have chosen a more appropriate day to bury Herculaneum and Pompeii, perhaps to punish the inhabitants of these towns for practicing open prostitution and sexual activity, painting nudity (no fig leaf was necessary), displaying scenes and situations that are pornographic in the Judeo-Christian tradition, displaying everywhere the erect phallus as a potent charm and symbol of fertility: On jewelry, in paintings, on statues, on shop signs, on door entrances. The Villa of the Mysteries close to the Herculaneum Gate in Pompeii was used for practicing religions that were not approved by Rome. These included worshiping Bacchus, the God of Wine, and transforming feasts into rituals. After Pompeii was buried under more than 4 m and Herculaneum under more than 10 m of pyroclastic material, the Roman emperor Titus dispensed aid to the survivors and sent search teams to Pompeii to recover valuables. But a year later when these teams were recalled the ruins were left to robbers and looters, as the scavengers relatively easily dug wells in loose layers of pumice and from there horizontal tunnels from room to room in the buried houses. The consolidated material over Herculaneum was, however, more difficult to penetrate and looting was much less effective. The names of Pompeii and Herculaneum persisted in the memory of local peoples, but their locations were gradually forgotten with time as new towns, slums, and villas were constructed and destroyed by the restless volcano.

Between the Normans of the twelfth century and Spaniards of the sixteenth century, the Vesuvius area had to endure the Germans, the Angevins, the Aragonese, and the medieval mentality that had little need of Greco–Roman contributions to the Western Civilization. The Renaissance initiated in the thirteenth century began to change some of this mentality as the ancient Greek and Roman cultures began to be appreciated once more. The artists began busily copying the ancient sculpture and architecture, and reading of ancient manuscripts became fashionable again. These sculptures and manuscripts were now worth their weight in gold, but Pompeii and Herculaneum would not yield their treasures easily even when an inspired topographer, Ambrogio Leone, in 1503 made a map of Campania and marked on it Herculaneum not far from the actual site. Another chance for discovery occurred in 1594 when the aristocrat Count Muzzio Tuttavilla wanted to divert water from Sarno River to his weapons factory in Torre Annunziata by digging a canal. His architect Domenico Fontana supervised the digging and came across painted walls and inscriptions, including the one that contained the words '*decurio Pompeiis*'. These inscriptions were, however, tossed aside because they were interpreted as referring to Pompey the Great. The same water canal also passed only few meters

from the famous Roman villa of Oplontis belonging to Poppaea Sabina or Nero's second wife, missing again on another great discovery. The Gods obviously did not want the Spanish conquerors to loot this treasure too! The following breakthrough for a great discovery came in 1637 when the German scholar Holstenium proposed that the ancient inscriptions found in 1594 should be associated with the site of ancient Pompeii, but both Pompeii and Herculaneum kept sleeping on (Deiss, 1989).

In 1503 the Kingdom of Naples passed under the Spanish domination and lasted for two centuries. And when Charles V bequeathed the greater part of his empire to his son Philip II (1527–1598) this utilized the gold and silver from the New World and profits from East Indies commerce in the interest of Spain to restore the dominion of the Roman Catholic Church over the Western Christendom. When Philip died he left some 300 000 Vesuvius area inhabitants in the hands of his son Philip III, under whom the Spanish monarchic absolutism continued until 1621 when his son Philip IV brought even more misery to the Vesuvius area (Gleijeses, 1990).

In 1664 Philip IV died and left the Spanish monarchy to his 4-year-old son Charles II to lead the kingdom under his regent mother Mary Ann of Austria. Misery and devaluation of currency continued, and when Charles II died in 1700 a war of succession for the Kingdom of Spain broke out, with both the French and the Austrians claiming the rights. A minority of nobles in Naples favored the Austrians, but the nobles attached to Spain overpowered them. The new Spanish Bourbon King Philip V even came to Naples in 1702, but soon departed to fight wars, leaving the Kingdom of Naples to an easy conquest by Austrians who were controlling the northern Italy. When the Austrians entered Naples on 7 July 1702, the 200 years of uninterrupted Spanish domination ended and the social, moral, and political reality of Neapolitans of this time is perhaps best described by Giambattista Vico (1668–1744): 'In the capitol the lower class is fickle, the middle class fears of agitations and loves peace, whereas the nobles envy each other, hold pompous feasts, and hate all activity. The custom of people, beyond the vanity and ostentation, can best be characterized by the passion for luxury' (D'Ambrosio, 1995, p. 146).

In spite of the oppressive Spanish domination, the era did produce some notable scholars, sculptors, and architects (Gleijeses, 1990; D'Ambrosio, 1995; Ruggiero, 1998): The literary figures Torquato Tasso (1544–1595), Vittoria Colonna (1492–1547), Giambattista Marino (1569–1625); historian with passion for archeology Giulio Cesare Capaccio (1550–1633) who became the first to be interested in the ruins of Paestum; architect Domenco Fontana (1543–1607) whose many works in Naples include the Church of Gesù and Maria, and beginning work on the Royal Palace; painters Battistello Caracciolo (1570–1637), Luca Giordano (1632–1705) (nicknamed '*Luca fa presto*' for his fast painting), and Francesco Solimena (1657–1747), some of whose works can be found in the Churches of S. Nicola alla Carità and S. Martino, and altar of the Chapel of S. Gennaro.

The Austrian domination of the Vesuvius area lasted only for a brief period, between 1707 and 1734, but marks the beginning of the rediscovery of Herculaneum by chance. In 1711 a peasant from Resina, Giovanni Battista Nocerino, was digging a well when he stumbled upon a rare and colorful marble. Knowing that in the nearby town of Portici an Austrian prince and army officer, Emanuel Moritz of

Lorraine, Prince d'Elboeuf, was building a luxurious villa, Nocerino showed the marble to the Prince. The quality of the marble immediately impressed the Prince who bought the land rights. The well of Nocerino was enlarged and lateral subterranean tunnels dug from where more colored marble, columns, and sculptures were plundered. When complete sculptures began emerging, however, Prince d'Elboeuf began plundering the works of art and even managed to smuggle some statues out of Italy and present them as gifts to his commander-in-chief, the Austrian general Prince Francois-Eugène de Savoie-Carignan (Getty, 1992, p. 19). Prince d'Elboeuf never, realized, however, that he stumbled upon the ancient theater of Herculaneum and the ancient town was left again to its grave-like peace. In 1736 Prince Eugène died and his Herculaneum statues entered the Dresden collection of Frederick Augustus, Elector of Saxony.

When the war for Spanish succession ended in 1713, the new King Philip V had to respect, at least for a while, the domination of Italy by the Austrian emperor Charles VI. Philip's wife, Elizabeth Farnese, wanted however a kingdom for her children and when France and Spain became allies against Austria she got her wish. In 1734 Farnese's first son and prince Charles of Bourbon became the new sovran of the Kingdom of Naples and a year later also that of the Kingdom of Sicily. And as the chance would have it, Charles' wife Princess Maria Amalia Christina was the daughter of Frederick Augustus, Elector of Saxony, who now owned those Herculaneum statues that were given to Prince Eugène by Prince d'Elboeuf. The new Princess of Naples was thus familiar with Herculaneum and knew what she must do next.

As the bride of Charles, the first Spanish Bourbon King, Princess Christina encouraged her husband to resume the work of Prince d'Elboeuf. In October 1738 the King ordered digging at Herculaneum and appointed his army engineer, Roque Joaquin de Alcubierre, to direct the project. Two months later a tablet was excavated beneath Resina that read 'Lucius Annius Mammianus Rufus has financed the construction of this building, the theater of Herculaneum' (Getty, 1992, p. 21). One ancient town buried by Vesuvius in 79 A.D. was finally resurrected.

King Charles could hardly have made a worse choice for his archeologist, since Alcubierre showed little regard for documenting the finds. He enlarged previous tunnels and dug in all directions, soon realizing the existence of a large town. Bronze and marble sculptures were wrested from the ground and brought to nearby Royal Palace of Portici where the King established a jealously guarded museum and a 'no admittance room' that housed all of those treasures considered to be pornographic at the time. With time, however, these works of art came to the present resting place in the National Archeological Museum of Naples. Deiss (1989, p. 27) puts it like this about Alcubierre's zest to unearth the treasures of Herculaneum: 'Alcubierre, hot for speculation discoveries, paid little heed to anything else. This military engineer was guilty of such stupidities as removing bronze letters without first recording the inscriptions. Everything was haphazard. Digging was done on whim. Though daily reports were issued, and a diary kept in Spanish, no record of the details of each find – its place, position, relation to other objects – was kept. No plans and elevations were made. The burrowing went on everywhere about the town – along streets, over roofs, through frescoes, mosaics, wooden doors, vaults – undermining, smashing, snatching'.

The work in Herculaneum tunnels was slow and dangerous, water and slime dripped from walls, carbon dioxide was threatening asphyxiation as this was the time when Vesuvius was producing frequent 'open-conduit' eruptions, and the digging hardly progressed and yielded new treasures. This and the new evidence from peasants that the hill *Civita* near Stabia looks promising for digging prompted Alcubierre to convince his King to approve digging at the 'Pompeii ruins' on 30 March 1748. In 1750 Alcubierre's obligations as an officer and the responsible of new dig prompted him to request that someone else oversees the work at Herculaneum under his supervision. King Charles assigned this task to his Swiss architect Karl Weber who began the first disciplined archeological approach to the excavations. This approach also caused jealousy on the part of Alcubierre for whom Weber was 'irresponsible', because he took the time to map meticulously every new find, instead of rushing for the treasure. Weber's meticulous work paid handsomely, however, when in 1750 his well-diggers struck a circular marble pavement that turned out to be the rotunda of a garden belvedere. Subsequent digging through underground tunnels revealed that this pavement belongs to the Villa of the Papyri and in 1754 Weber produced a detailed map of it on the basis of which J.P. Getty constructed his museum in Malibu (Getty, 1992).

Weber's successor, Francesco La Vega, also helped to define the boundaries of the Villa of the Papyri and produced the first ever plan of Herculaneum before the tunnels were refilled and digging completely shifted to Pompeii where the treasure was more appealing. In 1763 the 'Pompeii ruins' were definitely established as the ancient Pompeii and the news rapidly became known throughout the civilized world. Before Charles of Bourbon ascended to the Spanish throne as Charles III in 1759 he not only brought to Naples the antiquity collections of his mother Elizabeth Farnese, but also established in 1755 Academy of Ercolano (*Accademia Ercolanese*) to study and publish information about the finds at both Herculaneum and Pompeii. As the King, Charles III also issued in 1763 a royal decree against ignominious demolitions of ruins.

Charles III is a product of Enlightenment. He promoted excavations at Herculaneum and Pompeii not only for cultural reasons, but also to make his kingdom richer. He streamlined the state administration and diminished the power of feudal lords, improved city's infrastructures, and constructed the Royal Theater San Carlo in 1737. Charles of Bourbon also initiated the construction of the Royal Villa of Portici in 1738 and the Royal Palace of Caserta in 1752. This latter palace was designed by the architect Luigi Vanvitelli and was completed many years later by Charles' son Ferdinand IV who became the new King of the Kingdom of Naples after his father relinquished the throne for that of Spain's in 1759 (Gleileses, 1990, pp. 671–672).

The likely reason for constructing a royal villa in Portici is that King Charles needed a summer residence and a place to house all of that treasure from Herculaneum and thus demonstrate the power of his monarchy. This royal villa is more than a villa; it is a royal palace which together with other villas of nobles constructed around it form today an important patrimony of the Vesuvius area. In all there are 121 such villas and only some of them have been restored to their former grandeur. Today, the Royal Palace of Portici is the home of the Agrarian University

of Portici and some of the villas, like Villa Campolieto, Villa Ruggiero, and Villa Savonarola are used for cultural purposes. Most of these villas are located along the same road (Royal Road) which even today connects Naples with S. Giorgio a Cremano, Portici, Ercolano, Torre del Greco, Torre Annunziata, Pompei, and other towns to the East.

Ferdinand IV reigned between 1759 and 1825, but had to escape twice from Naples and take refuge in Palermo because of the Age of Revolutions that began sweeping all over Europe at the end of the eighteenth century. And when in 1793 the French revolutionists guillotined Louis XVI, the Kingdom of Naples sided with England and allowed Admiral Horatio Nelson to enter the port with his fleet in order to prevent the French from dominating the Mediterranean. This marriage did not last for long, however, because in 1798 the French occupied Rome and by the end of the year Ferdinand IV and his court had to flee on the Nelson's ship *Vanguard*. A month later the French general Championnet proclaimed Naples the Republic Partenope. This republic lasted, however, only for 5 months as the French were unable to restore tranquility at home and Napoleon became the new leader. With admiral Nelson's help, Ferdinand IV returned to Naples and his wife, Maria Carolina and the real power of the kingdom, saw to it that the republicans pay with their lives, most probably to avenge her sister Queen Maria Antoiniette of France who was guillotined in 1793 by the French Republicans. In 1799 Napoleon Bonaparte came to power in France and spared Ferdinand's kingdom, only because the King promised not to allow the access of English and Turkish fleets into the kingdom's ports. But Maria Carolina continued to plot with Napoleon's enemies, England and Russia, and in 1806 Napoleon stripped Ferdinand IV from his power and declared that his brother Giuseppe Bonaparte takes control of the Kingdom of Naples.

The new French conqueror of the Vesuvius area instituted reforms, introduced the Napoleonic Code, and gave a new impulse to resurrecting Pompeii by increasing significantly the work force. When 2 years later Giuseppe Bonaparte was summoned by Napoleon to take the crown of Spain, that of Naples passed to Joachim Murat (1771–1815). Murat was an exceptional and dashing cavalry leader and general that served with Napoleon in Egypt, Austerlitz, Jena, and Moscowa, just to name some of the most famous battle grounds of the Napoleonic era. This 'Apollo of War' caused fearful cavalry openings in enemy lines; he was fearful, indomitable, untiring, charging attack after attack, repeatedly, until the resistance of the enemy was broken. As the new sovran of Naples, Murat soon organized the army, continued the reforms of his predecessor, and resurrected more and more of Pompeii. His wife Caroline Bonaparte (sister of Napoleon Bonaparte) contributed in this effort by promoting the excavations through correspondence and publication of *Les ruines de Pompeii*. The end of the Napoleonic era also brought the end of Murat's reign, although he tried to save the kingdom by negotiating with Austrians and English, and rallying the Italians on his side. But this was not to be and Murat was shot by an Austrian firing squad for undermining the new order which repossessed the Kingdom of Naples for the exiled Bourbon King Ferdinand IV.

With his wife Maria Carolina deceased, Ferdinand IV repossessed his Kingdom of Naples in 1817, pardoned those siding with the French, adopted the Napoleonic

Code, and by a decree changed his title from 'Ferdinand IV King of Naples and Sicily' to 'Ferdinand I King of the Two Sicilies'. The reinstituted regime had, however, very difficult times as the growth of European nationalism became more and more intensive. The Italian *Carbonari* or secret societies began plotting freedom from Austria and unifying Italy. When in 1825 Ferdinand I died he just finished building *Palazzo S. Giacomo* (today's Municipal Palace of Naples), built the first steam ship *Ferdinando I* in 1818, and established the first ever navigational company in Mediterranean in 1823 (*Società Napoletana delle Due Sicilie*). His son Francis I tried to maintain the status quo of his father and in 1828, after a lapse of 63 years, ordered a resumption of digging at Herculaneum. The new digs ignored the tunnels and proceeded digging as in Pompeii in the open by exposing the site. Hacking away the consolidated pyroclastic muck tens of meters deep was much more difficult than digging in the pumice layers of Pompeii, and as the digs began uncovering houses of the ancient city the people nearby began again taking pride of their town of Resina by calling it Ercolano, as if this town existed from ancient times. But the digging of Herculaneum was not producing a sufficient interest as the houses were wrecked as they were revealed, and the project was soon abandoned.

When in 1830 Francis I was succeeded by his 21-year-old son Ferdinand II the new King of the Two Sicilies reorganized the military and economy, married Maria Christina of Savoia, and when she died in 1831 married Maria Teresa, the daughter of the Hapsburg archduke Charles, bringing the kingdom closer to Austria. During his reign, the first ever Italian railway from Naples to Portici was inaugurated in 1839, but the times were difficult as there was less and less of a need for monarchy and more for a new order with liberal constitutional government that restricted the powers of the head of state. The sentiments for a unified Italy were running high among the intellectuals. 'The people do not understand anything of liberty, of Constitution, and of equality; they only know of hunger and how to ask for bread', wrote a contemporary of the period about the lower class (D'Ambrosio, 1995, p. 196). Contrary to his father Francis I, Ferdinand II constructed roads, schools, colleges, cemeteries, and first gas illumination and railroad. When he died in 1859 his son Francis II was only 23 years old and soon had to give way to the 'The Thousand' Garibaldians who in 1860 marched from Sicily toward Rome and on their way unifying and incorporating the last bastions of the Bourbon dynasty. People of the two Kingdoms of Sicily preferred a unified Italian state, and when Garibaldi unopposed entered Naples he was welcomed as a hero. Garibaldi even appointed his ardent supporter Alexandre Dumas, the famous author of *The Three Musketeers*, as the director of the museum in Naples and of the excavations at Herculaneum and Pompeii, but Dumas soon resigned as he was hardly fitted for the post. People of Italy, or more precisely the new Piedmontese liberal regime, preferred a constitutional King Victor Emanuel II, instead a republican Giuseppe Garibaldi who soon afterwards retired into obscurity.

The first liberal Italian state also appointed the first scientifically minded director of Pompeii and Herculaneum excavations, Giuseppe Fiorelli. Fiorelli established the first journal of excavations for the purpose of recording Pompeiian finds systematically. In 1869 the excavations at Herculaneum were also resumed and with them the oppositions of landlords who owned the land above. These *padroni* finally put a stop to the

enterprise in 1875 and further digging in Herculaneum had to wait until 1927 when Mussolini's iron hand ordered the resumption of this work (Deiss, 1989, p. 31). With new machines and archeological techniques, and a new man, Amadeo Maiuri, the streets of Herculaneum began to see the light again. And this light has been shinning ever since at both Herculaneum and Pompeii, except during the period of World War II.

A most limited archeological dig requires 'clinometer for measuring slopes, plane table for measuring angles, alidade for showing degree of arc, prismatic compass for taking accurate bearings, leveling staves for measuring elevations, templates for recording the curves of moldings; brooms, brushes, and mason's tools for cleaning architectural finds; zinc plates and sodium hydroxide pencils for electrolysis of coins; measuring tapes of different sizes, drawing instruments, trowels, marking pegs, paper for taking "squeezes" of inscriptions; cataloging and drawing material. ... For a major dig like Herculaneum ... the traditional pick and shovel and refuse basket must be augmented with compressed-air drills, electrical saws, bulldozers, and dump trucks. For restorations of mosaics, frescoes, marbles, and bronze and wooden objects the most skilled artists of these trades are also required' (Deiss, 1989, p. 32). Chemists, metallurgists, and physicists for determining the contents of jars, paints, and dating with radioactive isotope carbon 14 are also necessary. And when digging in Herculaneum and Pompeii this list must be augmented with the specialists in Latin, Greek, Oscan, Etruscan, and Egyptian tongues.

Grand Tour

Beginning with the seventeenth century, professionally organized tours of the Continental Europe began to appear in England. These tours arose from a need of nobles to extend their matrimonial alliances and more direct contacts with foreign courts, as the discoveries of new navigational routes and conquests of new territories demanded more and more international experience. The noble's educational process began to be considered complete only after acquiring an experience of travel which was viewed as an alternative to spending the time at a university. Italy, in particular, had a lot to offer: Remants of the Greco–Roman Civilization, a Renaissance culture second to non, unsurpassed natural beauty and climate, and, of course, the volcanoes Vesuvius, Etna, Stromboli, and Vulcano. This cradle of volcanology became an indispensable place to visit and write about during the long voyages which normally started in Turin or Genoa, depending on whether one arrived in Italy by land or by ship. The route along the coast from Marseille to Genoa soon became preferred as the noble could spend the summer in France before entering Italy in early fall. The travelers of Grand Tour were generally young, between the ages of 18 and 21, and a tour lasted from 18 to 36 months, depending on the resources of the noble. These tours were organized with maps and personal guides, and during the Age of Enlightenment reached their greatest popularity (Getty, 1992; Gasparini and Musella, 1991).

In 1626 Francis Bacon was one of the first to offer suggestions on how to take a maximum advantage of the tour: 'For a young noble to take maximum advantage from a tour it is necessary that he behaves in a certain manner. First, he should know something of the language of the country that he plans to visit. Then he should have with him a serve or a tutor for a guide and some books that describe the country. It is

also necessary that the noble keeps a detailed diary during the voyage, does not stay for too long in any one place, and frequent the best circles and meet important personalities of the country' (Gasparini and Musella, 1991, p. 66).

By the beginning of the eighteenth century the tour guides contained detailed information about the country's culture, exchange rate, distances between cities, dangers, and so on. During the Age of Reason when the Grand Tour reached its peak, the travelers increasingly explored the differences between their places of origin and the places visited, and helped spread the newly acquired culture to wider audiences. A typical tour started in the early fall through Venice and the Tuscan cities of Florence, Siena, and Pisa. The winter months were spent in Rome, whereas the spring in Naples and Vesuvius area where the traveler had a firsthand opportunity to encounter the remnants of the Greco–Roman Civilization at Herculaneum, Pompeii, Paestum, and nearby Sicily with its splendid Greek ruins at Segesta, Erice, Selinunte, Agrigento, and Syracuse. After the eruption of 1631, Vesuvius represented another object of great natural curiosity, for its frequent open-conduit eruptions personally and emotionally affected the traveler. Down below, in the Kingdom of Naples, the traveler had another opportunity to become immersed in a unique culture of the continent.

By the end of the Napoleonic era the Grand Tour came to an end. Scientific Revolution and Enlightenment had produced their effects and helped bring about the Industrial Revolution that created a new middle class with anxiety to travel and acquire new experiences, and the Grand Tour began to be transformed into 'mass tourism'. Slow travels by coach began to be replaced by fast steamboats and trains. In 1817 Byron wrote from Italy: 'Rome is full of pestilent English. One must be crazy to travel in France and Italy before this crowd of unfortunates returns home' (Capuano, 1997).

Soon after the eruption of 1631 and opening of ruins at Herculaneum and Pompeii in the 1750s, the excursions on Vesuvius became almost obligatory as a part of the Grand Tour, and many well-known scholars and personalities from the Enlightenment and Romanticism of the late eighteenth and early nineteenth centuries visited the volcano and wrote about their experiences. For best results of the tour, the traveler arrived at the crater at sunset to view the Sun disappearing into the sea just beyond the Bay of Naples, observed the pyrotechnic spectacle of gas and pyroclasts shooting high into the atmosphere or lava filling the crater floor during the night, and headed down the volcano at dawn. With the inauguration of Naples–Portici railway service in 1839 and construction of a tramway line between Pomigliano and lower station of the cable car in 1902, the ascent on Vesuvius was transformed into tourism. French essayist Montagne (1533–1592); English essayist, poet, and statesman Joseph Addison (1672–1719); French political philosopher and man of letters Montesquieu (1689–1755); German poet, dramatist, and novelist Goethe (1749–1832); and the great musical genius Mozart (1756–1791) are just a handful of the European travelers whose diaries transformed into literature and guides for thousands in the seventeenth and eighteenth centuries. In the nineteenth century, these guides began to be transformed by Thomas Cook and others into cookbooks and the *élite* travelers of the Grand Tour into tourists that we know today.

In 1755 Charles of Bourbon established *Accademia Ercolanese* to study and publish information about the finds at Herculaneum and Pompeii, and in 1757 the Academy published 100 copies of the first of eight volumes entitled *Le antichità di Ercolano esposte*. These copies were intended strictly for distribution by the King, but the pirated editions in English, German, and French soon became known throughout Europe. Herculaneum and Pompeii motifs inspired a new appreciation for classical styles and had an enormous impact on the cultural life of Europe and Grand Tour travelers. The fascination with antiquity had originated in the Renaissance, and Herculaneum and Pompeii were the catalysts for the development of Neoclassicism (Getty, 1992, p. 21). Antiquity was looked upon as the perfection in the art and design, and inspired changes in the eighteenth century decorative arts, painting, architecture, dress, and jewelry. Decorative motifs from antiquity appeared on ceramics products and Pompeiian wall paintings on porcelain. Decoration *à la grecque* came into vogue in Paris. The neoclassical style of architecture influenced Thomas Jefferson in building his home in Monticello, United States Capitol in Washington, DC, and so on.

As a noted personality of the Bourbon court of Naples and wife of the British Ambassador Sir William Hamilton, Emma Lyon sometimes entertained guests and is immortalized in portraits wearing costumes inspired by Greco–Roman vases. This is what Goethe (1994, p. 171) wrote about her: 'He [William Hamilton] has had a Grecian costume made for her that suits her to perfection, and she lets down her hair, takes a few shawls, and varies her postures, gestures, expressions, etc., until at last the onlooker really thinks he is dreaming. In her movements and surprising variety one sees perfected what so many thousands of artists would have liked to achieve. Standing, kneeling, sitting, lying, grave, sad, roguish, wanton, penitent, enticing, menacing, fearful, etc., one follows upon the other and from the other. She knows how to choose and change the folds of her veil to set off each expression, and makes herself a hundred different headdresses with the same cloths. The old knight holds up the light for the performance and has devoted himself heart and soul to this art object. He sees in her all the antiquities, all the beautiful profiles on Sicilian coins, even the *Apollo Belvedere* itself'.

For the Grand Tour travelers, a visit to the Royal Museum of Portici became a necessity, and when the mistress of King Louis XV, Madame de Pompadour, visited the museum in 1749 she brought with her the artist Charles Nicolas Cochin who later reproduced his observations in *Observations sur les antiquitès d'Herculanum*. In 1758 the German art historian Johann Joachim Wincklemann was not only annoyed by the restrictions precluding sketching and note-taking of the treasure at the museum, but was also the first to classify the archeological finds and to distinguish between Greek art and Roman copies. In addition to utilizing art for aimless amassing, Wincklemann proposed that such objects be studies for understanding of Greek and Roman cultures, thus contributing significantly to the Neoclassical movement. The German poet Goethe wrote of Wincklemann that he was 'like Columbus who had in mind a notion of the New World before he actually saw it' (Getty, 1992, p. 24).

In 1787 Goethe traveled to Italy and in his *Italian Journey* wrote about his experiences at Pompeii, Herculaneum, museum in Portici, and excursions to

Vesuvius: 'Everyone is astonished by the small, cramped size of Pompeii. Narrow streets, although straight and provided with stone walkways on the side; little windowless houses, the rooms that lead from the courtyards and galleries lit only through their doors. Even public works, the bench at the gate, the temple, and then also a nearby villa [Goethe is referring to the tomb of the priestess Mamia, the temple of Isis, and villa of Diomedes in front of the Herculaneum Gate] are more like models and doll houses than buildings. But these rooms, corridors, and galleries are most brightly painted, a solid color on the wall surfaces, but in the middle a detailed painting (now mostly chipped away), and light, tasteful arabesques on the edges and ends, which then are further developed into dainty figures of children and nymphs, while on another side wild and tame beasts emerge from thick garlands of flowers. And so even in its present desolate condition, a town first covered by a rain of stones and ash, then plundered by its excavators, still indicates that a whole nation had a delight in art and pictures which even the keenest modern art lover can neither understand, nor feel, nor desire' (Goethe, 1994, pp. 162–163).

'That ancient town [of Herculaneum], located at the foot of Vesuvius, was completely covered with lava, made deeper by subsequent eruptions, so that the buildings are now sixty feet below the surface. It was discovered by someone digging a well and struck inlaid marble floors. A great pity that the excavation was not systematically carried out by German miners: For certainly the haphazard later digging has wastefully destroyed many a noble relic of antiquity. Sixty steps lead down into a vault where by torchlight one can gaze in amazement at the theater, which once stood under the open sky, and hear about all the things that were found there and brought up to the surface. [At Portici Tischbein (a visual sketch artist who made drawings for Goethe) and I] entered the museum well recommended and were well received. But even so, we were not permitted to sketch anything. Perhaps, as a result, we paid that much closer attention and transported ourselves the more eagerly into that vanished era when all these items stood around for the active use and enjoyment of their owners. Those little houses and rooms in Pompeii now seemed to me both more cramped and more spacious: More cramped, because I pictured them crowded with all these worthy objects, more spacious, because these same objects were not there merely out of necessity, but were so very ingeniously and charmingly decorated and enlivened by visual art that they delight and expand the mind more than the most spacious interior could' (Goethe, 1994, p. 173).

'The road [to Vesuvius] through the outermost suburbs and gardens proved to be an early indication of something Plutonic. Since it had not rained in a long while, the naturally evergreen leaves were covered with a thick, ash-gray dust, and all the roofs, girdle ledges, and whatever else offered any kind of surface were likewise coated with gray, and only the splendid blue sky and the powerful, radiant Sun were proof that we were still among the living. At the foot of the steep incline we were met by two guides, an older and younger one, both sturdy men. The first dragged me up the mountain, the second one Tichbein. I say dragged, for these guides gird themselves with a leather strap, which the traveler takes hold of and, since he is being pulled upwards, this makes it all the easier for him to climb up on his own feet with a staff. Thus we reached the surface over which the cone rises, the wreckage of Monte Somma to the

north. Like a curative bath, a glance westward over the region removed all the pains of exertion and all fatigue, and then we made a circuit around the cone, which is always smoking and ejecting stones and ashes. As long as there was enough room so that we could stay at a proper distance, it was grand, inspiring spectacle. First a violent thunder resounding out of the deepest abyss, then thousands of stones, larger and smaller ones, hurled into the air, veiled in clouds of ash. The greatest part fell back into the abyss. The other fragments, driven sideways, made a curious noise when falling onto the outer side of the cone: First the heavier ones thudded onto the side of the cone and bounced down it with a hollow sound. The lesser ones clattered after them, and finally the ash trickled down. This all took place with regular pauses, which we could easily measure by calmly counting. ... However, there is something exciting about a present danger and it challenges the contrary spirit in man to defy it. So I reflected that it must be possible, in the interval between two eruptions, to reach the abyss and return from it in that same space of time. I consulted with the guides about this under an overhanging rock of Monte Somma, where, securely encamped, we were refreshing ourselves with the supplies we had brought along. The younger guide was willing to try the adventure with me, we padded the crowns of our hats with silk and linen cloths, we put ourselves in a ready position, staffs in hand, I grasping the belt. While the little stones were still clattering around us, the ash still trickling, the robust youth was already pulling me over the glowing rubble. Here we stood at the enormous yawning abyss, whose smoke was being drawn away from us by a light breeze but at the same time veiled the interior of the pit, which was fuming all around from a thousand fissures. Rock walls, burst asunder, could be glimpsed here and there through a gap in the smoke. The view was neither instructive nor pleasant, but the very fact that we saw nothing made us wait to see something. Failing to count calmly, we stood on a sharp edge of the immense chasm. Suddenly the thunder resounded, the terrible charge flew past us, we instinctively ducked down, as if that would have saved us from the falling lumps. The smaller stones were clattering already, and without reflecting that we could now anticipate another pause, just happy to have survived the danger, we arrived at the foot of the cone along with the still trickling ash, our hats and shoulders all covered with it' (Goethe, 1994, pp. 158–159).

Not everybody saw the Vesuvian guides as heroes and the volcano something terrible (Capuano, 1997). For Robert Gray who toured the area in 1791, 'the guides work on our fear in order to extract additional recompense'. 'In addition of being scoundrels and perfect savages, they also wear St. Antony's cross, which according to them protects them against the fire from the mountain'. And after the English poet Percy Shelly visited Naples in 1818 he romanticized Vesuvius as something 'charming, picturesque, and pretty. ... The exotic and savage influence of guides' singing their primitive music is sweet and capable of profound effects, and their looks and attitudes in the darkness of the night acquire a suggestive enchantment'.

William Hamilton

As a British Ambassador, William Hamilton came to Naples with his wife Catherine Barlow in 1764 and saw his first eruption of Vesuvius. Catherine was of poor health and died in 1782, and it was not until 1791 that the beautiful Emma

Lyon became the Lady Hamilton. As an ardent hunter and collector of art (Jenkins and Sloan, 1996), Hamilton soon became fascinated with the volcano and climbed the mountain more than 300 times during 35 years of his tenure in Naples. The first eruption that Hamilton described was that of 1766. He sent a report to the Royal Society and since became a contributor to the Society's Philosophical Transactions. During the eruption of Vesuvius of 1767 he barely escaped by fleeing with his wife from Torre del Greco to Naples. In the city people panicked, disorders broke out, prisoners overpowered the guards, and crowds insisted that the archbishop orders a procession of San Gennaro. 'As the crowd became more tumultuous and intolerant, it forced the cardinal to take the relics of San Gennaro and bring them in a procession to the Bridge of S. Maddalena. When the relics came in view of the volcano the eruption ceased exactly at that moment' (Knight, 1997). The eruption continued, of course for a while, but with a much smaller intensity until it terminated several days later.

Hamilton preferred studying geology in the field and in addition to Vesuvius often frequented Ischia and Phlegraean Fields. This culminated in 1776 with the publication of his first edition of *Campi Phlegraei, Observations on the Volcanoes of the Two Sicilies* (Hamilton, 1776) which includes 54 color drawings of minerals that Hamilton collected in the Vesuvius area. In this book, volcano is not a monster to be afraid of but a good giant to respect and love. The eruptions are 'wonderful operations of nature, wanted by the Providence and framed within an immense design'. The volcano behaves like 'an immense plow, from which the nature serves itself to overturn the viscera of the earth'. After each eruption Vesuvius produces 'new fields to cultivate' and 'precious minerals to collect. The Volcano should be viewed in a creative instead in a destructive light'.

During his long tenure in Naples, Hamilton described every eruption and this is what he wrote about the great lava fountain eruption of 1779: 'In the evening [of 8 August] the smoke began issuing tumultuously from the crater and an hour later began a sequence of thunders accompanied by the ejection of ash and scoriae. At nine the same evening, an enormous explosion with an intensity of 100 cannon bursts shook Naples and Portici and the people ran to the streets. A jet of liquid fire began to be pumped from the volcano and in the fury the flow reached a stunning height, three times the height of the volcano. Impetuous gusts of smoke accompanied the emission of the fiery jet, and between the black clouds zigzagged the electric fire, pale but brilliant. These were the volcanic thunderbolts that rarely abandoned the clouds, but habitually returned to the large column of fire, in the proximity of the crater from which they issued'. As Hamilton noted, the lava fountain reached a height of about 3 km before the wind directed it toward Ottaviano. The jet consisted not only of magma, but also of rocks and scoriae that fell on the slopes of Vesuvius and burned forests on Monte Somma. The gigantic fountain lasted for half an hour and even caused the Neapolitans to ask San Gennaro for help. 'The population of this metropolis began to exhibit its double propensity toward the violence and superstition. At that point and in the absence of police actions, Naples suffered more from the intemperance of its population than from the infuriated volcano', commented Hamilton.

During his love affair with Vesuvius, Hamilton pioneered the identification of geological stratifications that are used today to read the history of Earth. And from these geological strata anticipated paleoanalysis which uses the layers of volcanic deposits to

identify different eruptions. Hamilton and many other naturalists of the seventeenth, eighteenth, and nineteenth centuries used Vesuvius as a laboratory for their studies, thus contributing to the development of earth science and shaping of Western Civilization.

49. The works of contemporary archeologists and physical anthropologists (Washburn, 1960) are consistent with Vygotsky's point of view that simple tools started the whole trend of human evolution.

50. Egan (1997, p. 118).

51. Thucydides (1980). While Herodotos was a child of Persian War, Thucydides was a witness of the Peleponnesian one, Herodotos was a Carian writing in Ionian, Thucydides was an Athenian and the founder of Attic prose and disciple of the Athenian sophists. Herodotos did try to find the truth in his stories, but this is not as accurate as that of Thucydides who applied the scientific method in recording history.

52. For the material in this and subsequent paragraphs I relied on Clough et al. (1964), Alighieri (1985), Sullivan et al. (1994), Cahn (1995), Machiavelli (1995), Augustine (1998, 2000), and Nasr (2001).

53. Theology became the central subject of study, with Abèlard (1079–1142) and Lombard (1100–1160) becoming its central figures. Huge body of knowledge from Greek philosophy became available again, first through Arabs via Spain and later directly from translations, and contradicted many basic Christian teachings. The Aristotelian rationalism that reason is capable to define order and that truth has its own reality irrespective of the tenets of the fate, clashed with the Augustinian tradition where reason cannot discover the ultimate truth but must come to the intellect through the illumination from divine sources beyond the power of human reason. This led the scholars such as Thomas Aquinas (1225–1274) to study revelation and reason. Prior to the twelfth century, the monastic ideal spurred material things and led to a bias toward the study of natural world. But the discovery of Greek and Moslem scientific works led to the conclusion that the material world is intelligible to human reason, that there is an order in nature because it was part of God's perfect order. A quest for new knowledge in the thirteenth century, by scholars such as Robert Grosseteste (1168–1253) and his pupil Roger Bacon (1214–1294), resulted in a thesis that the truth about the natural world could be gained only through observation and experimentation, thus paving the way for subsequent scientific discoveries.

54. Renaissance, or 'rebirth', grew from northern Italian cities of Florence, Venice, Pisa, and Milan from a need of newly formed and wealthy bourgeoisie to 'culture' themselves and their numerous offspring. The Renaissance artists and scholars intensified the belief of human form and intellect capable of discovering without at the same time being anti-religious or in contradiction with fundamental Christian beliefs. We are indebted to such towering figures of versatility as Da Vinci (1452–1519) and Michelangelo (1475–1564), poets Dante (1265–1321) and Petrarch (1304–1374), prosoist Boccaccio (1313–1375), political philosopher Machiavelli (1469–1527), dramatist Shakespeare (1564–1616), essayist Montaigne (1533–1592), novelist Cervantes (1547–1616), painters Bellini (1430–1516) and Titian (1477–1576), sculptor Cellini (1500–1571), and so on. In celebrated *The Prince*,

Machiavelli argues that Christian morals have little to do with the actual practice of politics, for to acquire and maintain political power the prince or governing officials must be willing to use amoral and ruthless means.

55. Portuguese explorers rounded Cape of Good Hope in 1488, Vasco da Gama reached India in 1498, Columbus reached the New World in 1492, and Magellan in 1519 set out around the world. These voyages generated in turn a prosperous new trade or rise of commercial capitalism in Western Europe and enormous expansion of the European domination on the expense of destroying Aztec and Incan Civilizations in Mexico and Peru.

56. We can note dramas of Molière (1622–1673), *Pensèes* of Pascal (1623–1662), *Paradise Lost* of Milton (1608–1674), baroque paintings of Rubens (1577–1640), portraits of El Greco (1548–1614), and works of the artistic genius Rembrandt (1606–1669).

57. There are many good books on the history of science, such as readily available Hall (1994) and Singer (1997).

58. Galilei (1984).

59. Newton (1974). See also Feingold (2004) for the consequences of Newton's theories and discoveries.

60. Cahn (1995), Bacon (1996), and Descartes (1966).

61. Bestermann (1969).

62. Smith (1976) and Rousseau (1968).

63. Diderot and d'Alembert (1751–1772).

64. Plato (1992, p. 211, 539b) and Egan (1997, p. 128).

65. Funk and Wagnalls (1966).

66. Plato (1992, p. 31, 354b).

67. Kierkegaard (1965, p. 49).

68. Ibid., pp. 272–273.

69. Descartes (1966, p. 60).

70. Herber Spencer was a Victorian thinker who dealt with evolution, social problems, and education (Spencer, 1961), among other things. He influenced John Dewey and many other nineteenth and twentieth centuries philosophers and countless teachers (Egan, 2002).

71. Spencer (1961, p. 82).

72. Egan (2004).

73. Ibid., p. 184.

74. Vygotsky (1978, p. 57).

75. Both the adolescents and the adults often feel powerless from the increasing pressures of the society around them and need to associate with whoever or whatever is best able to transcend or overcome the constraints from their society. For adolescents, these constrains can be parents and schools, whereas for adults this is normally the mediocrity of the social structure itself, because this provides limited possibilities to one's potential development.

76. Egan and Gajdamaschko (2004).

77. Quoted by Egan and Gajdamaschko (2004) from Vygotsky's collected works.

78. Egan (1997, p. 208).

79. We can note, for example, Hesiod's *Works and Days* (Hesiod, 2002) in which the didactic poetry is used for an exhortation to his younger brother, description of rules of husbandry and navigation, ethical and religious precepts, and calendar of lucky and unlucky days. In this way a farmer is made aware of his surroundings that are threatening him.
80. Egan (1997, p. 227).
81. The interested reader may wish to consult Eisner (1985), Goodlad (2004), and others for further exploration of teaching methods.
82. Lewis et al. (2004, p. 810) and Gage (2003).
83. In this section our school is in the Vesuvius area.
84. It is not important for small children to distinguish Pompei (modern) from Pompeii (ruins) and Ercolano (modern) from Herculaneum (ruins).
85. It would be inappropriate to have children believe that the bad (Vesuvius) cannot be conquered by something good (people).
86. Egan (1997, p. 253).
87. Hesiod (2002, Theogony: pp. 119–186) and Hamilton (1989, pp. 63–74).
88. Trotta (1998). Other participants on the project from Scuola Materna IV Circolo of Portici were Rosa Prudente, Franca Villani, Concetta Raillo, Rosa Zavino, Carla Ardizio, Adriana Cortese, Anna Costabile, and Giulia Garofolo. From Plesso Salesiani the participants were Anna Accardo and Maria Tenace. The President of the school, Lecce Carinno, supported the initiative.
89. This is one of several expositions which have been organized by GVES in the Vesuvius area. See note 141.
90. The eruptions of Vesuvius are elaborated in Chapter 1 (Dobran, 2006, Note 3). The rediscovery of Pompeii and Herculaneum and Grand Tour and Hamilton are elaborated above in Note 48.
91. In 1817 when the Bourbons regained power the Neapolitan Academy recommended the formation of Meteorological Observatory (*Osservatorio Meteorologico*), but nothing came of this until Ferdinand II was convinced that the physicist Macedonio Melloni (1798–1854) should be recalled from the exile in Paris and assigned its director (De Sanctis, 1997; Schettino, 1997). At the time Melloni was known for his studies of radiative heat propagation in the atmosphere and knew several well-known scientists who recommended him for this post. In 1839 the King nominated Melloni to direct a non-existent institute, and in 1841 Melloni proposed that the institute be located on the hill S. Salvatore, just below the crater of Vesuvius. The hill also contained a small Church and a small community of hermits. The King approved the project and in 1841 began the construction of 'a building dignified of the magnanimity of the sovran and grand ideas of an intelligent minister and scientific dignity to which it is destined'. The observatory was inaugurated before it was even completed in 1845 and Melloni defined its objectives as practical studies of earth physics, extraction of intimate secrets from nature and those associated with volcanic eruptions, observation of nature to obtain reliable data, and acquisition of adequate instruments for gathering data. The observatory was finally completed in 1847 and contained space for instruments, offices, a library, a conference room, and a belvedere, but Melloni hardly had the

time to move in when his King dismissed him several months later. This was the time of liberal unrests in Europe and Melloni could hardly hide his sentiments for which he was exiled in the past. Even the King lost fate in science after these unrests and wanted to transform the observatory into a hotel.

In 1852 Luigi Palmieri (1807–1898) from the University of Naples obtained authorization to use the observatory for his studies of electrical phenomena in the atmosphere, and in a short time was appointed as the new director of the meteorological institute, but did not accept the position until Melloni died in 1854. Under the leadership of Palmieri the observatory began to be used systematically for meteorological observations and publication of Annals of the Vesuvian Observatory (*Annali dell'Osservatorio Vesuviano*). He was also the first to design and construct an electromagnetic seismograph for monitoring earthquakes that proved very useful during the eruption of 1872. Palmieri also studied the premonitory signs of different phases of the eruption of 1894 and noted that the electric current on the slopes of Vesuvius varied with the volcanic activity. During his tenure as the director of the observatory, Palmieri published numerous reports dealing both with volcanic eruptions and electricity in the atmosphere (Palmieri, 1880; Nazzaro, 1997).

Palmieri was succeeded by Raffaele Matteucci in 1900, Giuseppe Mercalli in 1911, Allesandro Malladra in 1914, Giuseppe Imbó in 1935, Paolo Gasparini in 1973, Giuseppe Luongo in 1983, Lucia Civetta in 1993, and Giovanni Macedonio in 2003. During the eruption of 1906, the observatory was used to produce hourly telegraphic messages of the condition of the volcano, whereas during the eruption of 1944 Imbó and his wife were the only individuals recording this eruption. The first earthquake intensity scale was named after Mercalli. Recent directors of the observatory installed an extensive network of instruments for monitoring seismicity, ground deformation, electricity, gas composition, and gravimetry of the volcano.

Earthquakes have always been associated with volcanic eruptions and their registration has always been considered essential. Ground deformation of the volcanic cone relative to the sea level provides another indication that a volcano is preparing to erupt, and even Charles III had installed instruments in the Bay of Naples to collect this type of information. During the time of open-conduit eruptions the people around Vesuvius still worked their fields and paid guardians to watch from Church towers and ring bells in the event of danger from lava flows or changing eruption styles. In spite of the observatory, the people of the Vesuvius area even today keep a close vigilance over the volcano and as soon as they notice earthquakes or other suspicious signs inundate the switchboards of the observatory, town halls, and most recently seek opinions from independent experts via the Internet.

During the eighteenth and first half of the nineteenth centuries, many independent naturalists measured temperature, speed, density, and magnetic field of lavas, and collected minerals and crystals to furnish their private laboratories. One such scholar, Teodoro Monticelli, was not only the perpetual secretary of the Neapolitan Academy of Sciences (*Accademia delle Scienze Napoletana*), but also kept a volcanological museum at home. The institutionalization of the observatory into *Osservatorio*

Vesuviano has in recent years produced directors that value little interdisciplinary collaboration and constructive criticisms of the policies of the politicized group of Italian geologists and geophysicists. But those who wanted to study the volcano differently and were 'discouraged' by the autocrats of official institutions always found a way, like Gottfried Immanuel Friedlaender (1871–1948) who founded Institute of Volcanology of Villa Herta (*Istituto di Vulcanologia di Villa Herta*) and for 23 years published *Proceedings of Volcanology* (*Zeitschrift fur Vulkanologie*). Other independent twentieth century scholars of Vesuvius were James Johnston-Lavis (1856–1914), Alvord Perret (1867–1943), and Alfred Rittmann (1893–1980). In 1994 I founded GVES for promoting the objectives of VESUVIUS 2000.

92. Villa (2001) and Gazda (2000).

93. Martial (1993). A translation of Marcus Valerius Martialis' Latin text is:

> *This is Vesuvius, until recently green with wine leaves where the celebrated grapes filled the wet vats. These mountains Bacchus preferred more than the hills of his native Nysa, this is where the satyrs performed their dances. Here was the city of Venus [Pompeii] that she preferred over Sparta, and the city that was named after the glory of Hercules [Herculaneum]. Now everything is abeyantly buried from flames and gloomy ash. Even the Gods would not have permitted such a destruction.*

94. Caius Plinius Secundus (23–79) was born in Novum Comum (modern Como) from a wealthy father and was thus educated in rhetoric as any other Roman aristocrat of the time. His important teacher was Publius Pomponius Secundus – a frequenter of the courts of Caligula and Claudius. In 45, when he was 22, Pliny left Italy and served as a military tribune in Gallia Belgica. He was soon promoted to an army officer and stationed on the lower Rhine. In 52 he was back in Italy, but soon thereafter returned to Germany where he wrote a long history of Germanic Wars. Pliny returned to Rome again in 59, but could not fit into Nero's court of musicians and devoted himself to the literature.

Meanwhile, Pliny's sister Plinia gave birth in 62 to Caius Caecilius Secundus who after his father's death was adopted by his uncle Pliny. The younger Pliny changed his name to Caius Plinius Caecilius Secundus and we now know these Plinys as Pliny the Younger and Pliny the Elder. As Pliny the Younger was educated in his uncle's Roman house in Greek by Nicetes of Smyrna and in Latin by Quintilian, Nero was becoming more and more of a tyrant and in 68 committed suicide. The resulting civil war brought a new emperor, Vespasian, and Pliny the Elder suddenly had a spectacular career by serving as procurator in several Roman provinces. By 79 he was the prefect of the Roman navy stationed at Misenum (modern Miseno), with the responsibility for the safety of the entire western part of the Mediterranean. At this time he was also able to complete his *Natural History* (Pliny, 1942) – an encyclopedic treatment of subjects involving 37 books in all and based predominantly on Greek knowledge. Pliny the Elder was not the man of science in the Aristotelian sense, but rather a collector of information. This massive compilation of knowledge available to him was extremely influential in Middle Ages and was still used by some scholars in the nineteenth century. *Natural History* had a difficult time of being demolished by even the best of Renaissance scholars and is still a good source to consult on Greek authors.

95. Gibbon (1993, Chapter 3).
96. Gleijeses (1990, p. 11). The legend and popular folklore have it, of course, different. According to the legend, the origin of Naples is centered around the siren called Partenope – a fascinating and mythical creature that had the features of a bird and sweet face of a girl. (During the late medieval, Partenope assumed a different form: Half fish and half woman.) Partenope came from the island of the Sirens (often associated with the island of Li Galli in front of Positano in the Gulf of Salerno) which caused many shipwrecks because the ancient mariners lost their heads and control of their boats when they heard the irresistible singing of the inhabitants of this island. Only Ulysses (Odysseus, in Greek) and his crew managed to escape from this island and in desperation of losing him the siren Partenope killed herself. (In Greek Legend Odysseus was the King of Ithaca and one of the Greek leaders in the Trojan War and hero in Homer's *Odyssey*.) The waves took possession of her lifeless corpse and brought her to the island of Megaride where (presumably) lies her tomb and from where Naples was born. In yet another story, Partenope was not a siren but the daughter of a Greek who together with his fellow emigrants sailed to form a colony near Capo Miseno on the western edge of Bay of Naples. On their way to the colony they encountered a terrible storm and many were drowned, including Partenope. And as an act of tribute to her memory the storm survivors named their new city after her, because she was loved and admired by all (Ruggiero, 1998). Whatever the story, Partenope represents for Neapolitans their most prestigious relic and are sometimes overly fascinated by her existence and desire to identify her remains.
97. Gleijeses (1990, pp. 12–14).
98. Haywood (1967) and Garnsey and Saller (1987).
99. In the first century, Pompeii was surrounded by a wall about 8 m high and several meters wide, and contained several gates (Herculaneum, Vesuvian, Nolan, Sarnian, Nucerian, Stabian, Marine) that were protected by Minerva, the Goddess of Wisdom and defender of cities. The town center consisted of a large forum which was the center for civic life, banking, exchange, and economic and political information; a basilica where justice and some business were administered; various temples for worshipping the Gods and Goddesses, such as Venus (the town's protecting Goddess), Apollo (the Sun God), Jupiter (chief of all Gods), Vespasian, Lares, Fortune of Augustus, and Isis (the Goddess of Resurrection). Between Sarnian and Nucerian gates was situated a large Amphitheater that could hold most of the town's inhabitants, and nearby were the barracks of gladiators that entertained the crowds, although the Greeks were not very fond of this 'sport'. Pompeii also had a theater where many Greek tragedies were acted, several well-equipped baths (*thermae*), a large sports center (*palaestra*), as well as two cisterns close to the Vesuvian gate that supplied water through underground lead pipes from an aqueduct (*castellum aquae*) running from the inland mountains all the way to Naples and Miseno (Misenum) on the western tip of Bay of Naples.

The majority of people in and around Pompeii made their living from agriculture (wine, oil, wheat, barley), while others from several manufacturing industries

(fulling, bread baking). Boys and girls were taught how to read, write, and count, and only the patricians were instructed in rhetoric. Due to the prosperity of the city, many houses of patricians and wealthy businessmen (Faun, Venus, Menandro, Diadumeni, Lucretius, Centenari, Golden Lovers, Vetii) were lavishly constructed and decorated around an atrium (bed-, sitting-, and dining-rooms), peristyle, and porticos around a garden containing nymphs and colorful paintings. These public and private buildings were painted and decorated with frescoes and mosaics of bright colors (red, yellow, blue) and the city streets were paved and laid with shops, inns, and baths. Most of the roads were raised with pavements on either side and dotted with stepping tones to keep the pedestrians' feet dry from rubbish and animal waste. Beginning with the second century B.C. the Pompeiians began using *insulae* (or islands) to produce new living quarters within the city, and making use of pre-fabricated pieces of walls made of rock and mortar of limestone. The ground within the urban setting was not only used for living quarters, but also for business where the Greek-type gardens were employed to cultivate wine grapes, fruit, and flowers to make perfumes. Pompeii was more than a city within its walls, because it also contained large living quarters and villas outside of the city gates, like the Villa of the Mysteries (see Note 92).

100. The legend has it that the Pompeii's sister city Herculaneum was founded by Herakles (or Hercules as the Romans called him) on his return from Iberia: 'When Herakles had settled all his affairs in Italy as he wished, and when his fleet had arrived safely from Spain, he sacrificed a tithe of his spoils to the Gods, and founded a small city at the place where his fleet lay' (Dionysius of Halicarnassus, as quoted in Deiss, 1989, p. 6). As Zeus's best-loved son (his mother was Alcmene, the wife of Amphitryon, whom Zeus seduced by assuming the form of her husband) Hercules was worshipped as half-hero, half-God, for it is said that he had a gigantic strength and when in his cradle strangled two serpents that had been sent by Zeus's jealous wife Hera (Herakles in Greek means 'renowned through Hera'). As an adult, Hercules traveled widely through adventures and with him the Greek culture spread all over the Mediterranean.

101. Terremoti (1992, p. 22).

102. Renna (1992, p. 52).

103. The earthquakes in antiquity were not linked to the existence of a volcano or tectonic forces in the region as they would today, but, as Seneca explains, to the motion of air in large underground caves (*in laxos specus sub terras spiritum convenire*). Can the dead sheep that Seneca mentions (Renna, 1992, p. 52) be associated with the release of poisonous gas (carbon dioxide and sulfur) from the volcano as it was preparing to erupt? For an analysis of earthquake precursors of 79 A.D. eruption, see Chapter 4 (Marturano, 2006).

104. Radice (1963, letters 16 and 20).

105. The letters of Pliny the Younger have been subjected to the analysis for their literary, historic, and scientific value (Gigante, 1997), but whether they were written to describe an unprecedented natural calamity, immortalize Pliny the Elder as a hero, or create a special place for Pliny the Younger for posterity, is not very relevant, for they unquestionably represent lessons for future generations of

inhabitants of the Vesuvius area and elsewhere. These letters are also indispensable for the modern reconstruction of the famous eruption.

106. Latin text says '*hora fere septima*', or 'around the seventh hour'. Since in Roman time the first hour occurred at sunrise and the twelfth at sunset, irrespective of the time of year, the seventh hour is 1 p.m.

107. Rectina's house was some 30 km away from Miseno and her message must have taken several hours to arrive. This implies that Vesuvius produced some activity before Pliny could observe it at 1 p.m., as attested by modern studies of eruption products. For a description of eruptions see Chapter 1 (Dobran, 2006; Note 3).

108. Renna (1992, pp. 55–56).

109. Ibid., pp. 58–59.

110. After the eruption, Herculaneum sank below its pre-eruption level, because of the deflation of the volcano as a consequence of the evacuation of magma.

111. Andrews (1995).

112. Deiss (1989). The size of the city has been estimated from the seating capacity of its theater.

113. Radice (1993, p. 166).

114. In 1995 at Villa Campolieto, Ercolano; in 1996, 1997, and 1998 at Museo Nazionale di Pietrarsa, Portici; in 1998 at S.M.S. Don Milani, Portici; in 2000 and 2005 at Villa Savonarola, Portici.

115. Imperatrice (1998).

116. Comes (2004).

117. For security culture see Chapter 1 (Dobran, 2005), and for emergency culture see Protezione Civile (1995).

118. Comes (1997).

119. Portici is only 6 km away from the crater of the volcano and its 70 000 inhabitants and population density of about 15 000 people per square kilometer are an easy pray of the volcano. On 16th and 17th December 1631 this and other surrounding towns were completely destroyed by Vesuvius, and in the memory of those who perished the Spanish Viceroy Emmanuel Fonseca erected a memorial the following year. This memorial is located some 100 m from the Square of San Ciro on Via Nazionale in the direction of Naples. Its Latin inscription, barely visible on the marble plate, ominously instructs people what to do when Vesuvius becomes restless:

> *Listen. Twenty times from where the Sun shines, if the history does not make a mistake, has arisen Vesuvius, always with an immense carnage produced on those who were slow in flight. So that in the future it does not harm those who doubt, I [the stone memorial] am warning you. This mountain has a burdensome heart of bitumen, sulfur, iron, gold, silver, saltpeter, and sources of water. Sooner or later it will light up, but first it groans, shakes the ground, smokes, catches fire, whirls the air, roars horribly, thunders, and chases away the inhabitants. Run while you can. Here it blows, vomits a lake made of fire, comes down hastily, and runs over those who escape late. If it catches you, it is finished: You are dead! Contemptuousness oppresses the unaware and greedy for whom the house and possessions are more important than their lives. If you are wise, listen to this stone memorial which loudly speaks to you: Don't trust anybody; leave the possessions and without delay escape.*

120. VESUVIUS 2000 has been promoted through GVES since 1995. According to the teachers of Francesco d'Assisi (Note 121), this 'was the only organization on the territory that was promoting education, listening to the people like us, not being passive, promoting interdisciplinary collaboration, and proposing the creation of security and prosperity for the territory, instead of deporting people in masses as promoted by Vesuvius Evacuation Plan'.
121. Assisi (2004).
122. Teachers from Francesco d'Assisi participated at the following meetings on Vesuvius: 11 November 1995 at Comune di Torre del Greco; 22 November 1995 at S.M.S. Scotellaro, Ercolano; 3 February 1996 at Chiesa di Viale delle Mimose, Torre del Greco; 31 May 1996 at Associazione Medici di Torre del Greco; 27 March 1996 with teachers and students of University of Main (Germany) at S.M.S. Francesco d'Assisi, Torre del Greco; 8 February 1996 at Liceo Classico A. De Bottis, Torre del Greco; 12 October 1996 at Quartiere Nuovi Orizzonti, Torre del Greco; 29 April 1997 at University of Naples Federico II; 2 May 1997 at Parrocchia S. Maria del Principio, Torre del Greco; 10 October 1997 at I.T.C. L. Sturzo, Castellammare di Stabia; 5 November 1997 at Comune di Santa Maria la Carità; 6 November 1997 at Quartiere Torre Nord, Torre del Greco; 21 November 1997 at Associazione Medici Torresi, Torre del Greco; 2 September 2004 at VESUVIUS 2000 – Forum 2004, Villa Campolieto, Ercolano; 4 November 2005 at Villa Savonarola in Portici. Prof. Sorrentino collaborated on a study dealing with the volcanic risk education (Dobran and Sorrentino, 1998).

The teachers and students participated at several exhibitions: 16 December 1995 at Villa Campolieto in Ercolano to remember the eruption of 1631, with the work entitled 'L'eruzione vista da Braccini e Capece'; 16 December 1996 at Museo Ferroviario Nazionale di Pietrarsa in Portici with the work entitled 'L'Eruzioni del 1631 e quella del 1794'; 16 December 1997 at Museo Ferroviario Nazionale di Pietrarsa in Portici with the work entitled 'Il Vesuvio e il suo parco naturale'; 16 December 2000 at Villa Bruno in San Giorgio a Cremano and promoted by MCE with the work entitled 'Il Vesuvio in Peckwork'; 16 December 2001 at Villa Bruno in San Giorgio a Cremano with the work entitled 'Il Vesuvio e la sua storia eruttiva'; 4 November 2005 at Villa Savonarola in Portici.
123. See Chapter 3 (Di Donna, 2006).
124. Article 21 Law 59/97 of public instruction.
125. Scotellaro (2004a).
126. Brancaccio et al. (1998).
127. Scotellaro (2001).
128. Scotellaro (2004b).
129. Egan (1997, p. 263).
130. Dobran (1998).
131. Atripaldi and Students (1998).
132. Esposito et al. (1998).
133. Sturzo (1999).
134. The students' report (Sturzo, 1999) summarizes different risk levels of the emergency plan (Protezione Civile, 1995). See also GVES (1999).
135. These individuals do not hold these titles anymore.

136. Bradyseismic Crisis (1984).
137. Dobran (1994–1996, 1999), GVES (1999), Protezione Civile (1995), and RAI-TRE (1999).
138. Dobran and Sorrentino (1998).
139. These seminars deal with volcanic risk mitigation and have been given to school students and teachers, lay people, city administrators, university students, professionals, priests, scouts, and senior citizens. They include: Istituto Italiano per gli Studi Filosofici, Naples, 30 June 1995; Town Hall of San Sebastiano al Vesuvio, 30 June 1995; Town Hall of San Giorgio a Cremano, 10 July 1995; Town Hall of Boscoreale, 16 September 1995; IV Circolo Didattico, Torre del Greco, 5 October 1995; III Circolo Didattico, Portici, 11 October 1995; Town Hall of Cercola, Cercola, 24 October 1995; Town Hall of Torre del Greco, 11 November 1995; Town Hall of Ercolano, November 1995; S.M.S. R. Scotellaro, Ercolano, 22 November 1995; S.M.S. E. Iaccarino, Ercolano, 29 November 1995; Liceo Scientifico A. Nobel, Torre del Greco, 29 January 1996; Chiesa di Viale delle Mimose, Torre del Greco, 3 February 1996; Liceo Scientifico Statale, Torre del Greco, 8 February 1996; S.M.S. F. D'Assisi, Torre del Greco, 27 March 1996; IV Circolo Didattico, Ercolano, 2 April 1996; S.M.S. G. Cosenza, Castellammare di Stabia, 17 April 1996; S.M.S. O. Comes, Portici, 8 May 1996; S.M.S. Borrelli, S. Maria la Carità, 16 May 1996; Associazione Medici, Torre del Greco, 31 May 1996; S.M.S. F. D'Assisi, Torre del Greco, 20 September 1996; Liceo Classico De Bottis, Torre del Greco, 11 October 1996; Quartiere Nuovi Orizzonti, Torre del Greco, 12 October 1996; S.M.S. M. Melloni, Portici, 16 January 1997; S.M.S. B.V. Romano, Torre del Greco, 21 April 1997; S.M.S. M. Melloni, Portici, 28 April 1997; I.T.C. L. Einaudi, S. G. Vesuviano, 29 April 1997; Department of Geophysics and Volcanology, University of Naples Federico II, 29 April 1997; Casa Laboratorio Vesuvio 2, Ercolano, 30 April 1997; Parrocchia S. Maria del Principio, Torre del Greco, 2 May 1997; I.T.C. A. Tilgher, Ercolano, 3 May 1997; S.M.S. F. D'Assisi, Torre del Greco, 4 May 1997; Faculty of Letters, University of Naples Federico II, 5 May 1997; United States Naval Hospital (NATO), Agnano, 26 September 1997; I.T.C. L. Sturzo, Castellammare di Stabia, 10 October 1997; S.M.S. Don Milani, Portici, 31 October 1997; Town Hall of Gragnano, 14 November 1997; Town Hall of S. Maria la Carità, 5 November 1997; Quartiere Torre Nord, Torre del Greco, 6 November 1997; Associazione Medici, Torre del Greco, 21 November 1997; I.T.C. L. Sturzo, Castellammare di Stabia, 24 November 1997; Liceo Plinio Seniore, Castellammare di Stabia, 24 November 1997; Town Hall of Pompei, 3 December 1997; Associazioni FIDAPA-Lyons Host-Lyons Terme, Castellammare di Stabia, 10 December 1997; I.T.C. L. Sturzo, Castellammare di Stabia, 19 December 1997; Parrocchia S. Antonio, Torre del Greco, 24 February 1998; Parrocchia S. Antonio, Torre del Greco, 10 March 1998; Rotary Club of Castellammare di Stabia and Ottaviano, 13 March 1998; Chiesa di S. Antonio, Torre del Greco, 17 March 1998; San Sebastiano al Vesuvio, 20 March 1998; Biblioteca Comunale, Castellammare di Stabia, 27 March 1998; Circolo del Forestiero, 30 March 1998; Department of Geophysics and Volcanology, University of Naples Federico II, 2 April 1998; Department of

Geophysics and Volcanology, University of Naples Federico II, 3 April 1998; Biblioteca Comunale, Castellammare di Stabia, 3 April 1998; Circolo del Forestiero, Pompei, 4 April 1998; I.T.C. L. Sturzo, Castellammare di Stabia, 4 December 1998; Sport Club Oplonti, Torre del Greco, 24 April 1998; Pianeta Dona, Portici, 29 April 1998; Museo Nazionale Ferroviario di Pietrarsa, Portici, 16 December 1998; S.M.S. Don Milani, Portici, 16 December 1999; Sport Club Oplonti, Torre del Greco, 16 December, 1999; II Circolo Didattico di Gragnano, 17 December 1999; S.M.S. Don Milani, Portici, 20 December 1999; Scuola Elementare Gigliola Fiodo, S. Agnello, 21 December 1999; II Circolo Didattico, San Giuseppe Vesuviano, 22 December 1999; Circolo Nautico Stabia, Castellammare di Stabia, 28 December 1999; Villa Cycas, Portici, 6 January 2000; Circolo Nautico Stabia, Castellammare di Stabia, 3 January 2003; Liceo Scientifico Don Milani, Gragnano, 7 January 2003; Chiesa di Santa Teresa, Torre del Greco, 8 January 2003; Associazione FIDAPA, Gragnano, 9 January 2003; S.M.S. D'Assisi, Torre del Greco, 9 January 2003; Parrocchia del Carmine, Castellammare di Stabia, 10 January 2003; Liceo Scientifico F. Silvestri, Portici, 20 January 2004; Circolo Oplonti, Torre del Greco, 20 January 2004; I.T.C. P. Levi, Portici, 21 January 2004; Associazione Torrese Ingegneri e Architetti, Torre del Greco, 21 January 2004; Liceo Clasico De Bottis, Torre del Greco, 22 January 2004; Associazione FIDAPA, Gragnano, 22 January 2004; I.T.C. L. Sturzo, Castellammare di Stabia, 23 January 2004; Villa Campolieto, 2 September 2004; Associazione Culturale La Giostra, Torre del Greco, 13 January 2005; Istituto Comprensivo Statale Francesco d'Assisi, Torre del Greco, 14 January 2005; Scuola Media Statale Orazio Comes, Portici, 17 January 2005; Villa Savonarola, Portici, 4 November 2005; S.M.S. Ungaretti, Ercolano, 7 and 11 November 2005; I.T.C. e per Geometry E. Pantaleo, Torre del Greco, 9 November 2005; II Circolo Elementare, Ercolano, 10 November 2005; IV/V Circolo di Ercolano, 10 November 2005.

140. For negative habits of mind of Vesuvians, see Chapter 1 (Dobran, 2006).

141. GVES (Association for Global Volcanic and Environmental Systems Simulation) is a cultural organization of professionals and was founded in 1994 for the purpose of promoting the objectives of VESUVIUS 2000. Its address is: GVES, P.zza Matteotti, CP418, 80133 Napoli, Italy. See also www.westnet.com/~dobran. Some of the accomplishments of the members of this organization are:

A. Video Encounter With Vesuvius (*Incontro con il Vesuvio*) (Dobran, 1995) and book Vesuvius Risk Education (*Educazione al Rischio Vesuvio*) (Dobran, 1998).

B. 24 August 1995: Along the Route of Pliny, from Miseno to Granatello of Portici. This manifestation was organized to remember the anniversary of the plinian eruption of 79 and was entitled 'Return of "survivals" from the eruption of 24 August 79'. The 'survivals' that were brought by the boat Giobe from Miseno to Granatello were paintings of Alfonso Marquez, expressing the flight of Vesuvians during this eruption. These paintings were meant to symbolize a new hope for the Vesuvius area where its citizens should be actively involved in producing security and prosperity for the territory.

C. 16 December 1995: Villa Campolieto, Ercolano. This gathering was organized to provide an opportunity for Vesuvius area schools to share their educational

experiences pertaining to the volcano and its surrounding (drawings, models, recitations, music, and so on).

D. 16 December 1996: Museo Nazionale Ferroviario di Pietrarsa, Portici. This encounter 'So far ... so near' had the same objective as the preceding one, except that this was held at the National Railway Museum of Portici where many students could be received.

E. 3 November 1997: Excursion on Vesuvius with the secondary school students of Liceo Plinio Seniore of Castellammare di Stabia.

F. 16 December 1997: Museo Nazionale Ferroviario di Pietrarsa, Portici. This exposition of works on Vesuvius was entitled 'Vesuvius at school'.

G. 16 December 1998: Museo Nazionale Ferroviario di Pietrarsa, Portici. The title of this gathering was 'Education for Security Culture'. On this occasion the students were asked to compile a list of questions on what they saw and experienced during the encounter.

H. 16 December 1999: Scuola Media Statale Don Milani, Portici. This exposition of students' works on Vesuvius had similar objectives as those held in previous years at Museo Nazionale Ferroviario di Pietrarsa.

I. 16 December 2000: Saloni delle nuove terme di Stabia, Castellammare di Stabia. This gathering was entitled 'VESUVIUS 2000' and included schools from Pompei, Castellammare di Stabia, and other surrounding towns.

J. 4 November 2005; Villa Savonarola, Portici. At this gathering, the students from nearby schools were lectured on natural disasters, such as earthquakes, tsunamis, huricanes, and volcanic eruptions.

This is an incomplete list of schools which participated at these student encounters: Scuola Materna Bertelli, Portici; Scuola Materna IV Circolo, Portici; IV Circolo Didattico, Bagnoli; IV Circolo Didattico, Ercolano; Plesso Villanova, Ercolano; I Circolo Didattico, Portici; II Circolo Didattico, Portici; III Circolo Didattico, Portici; IV Circolo Didattico, Portici; IV Circolo Didattico, Torre del Greco; S.M.S. G. Bonito, Castellammare di Stabia; S.M.S. Borrelli, Castellammare di Stabia; S.M.S. E. Cosenza, Castellammare di Stabia; S.M.S. E. Iaccarino, Ercolano; S.M.S. D. Iovino, Ercolano; S.M.S. R. Scotellaro, Ercolano; S.M.S. O. Comes, Portici; S.M.S. M. Melloni, Portici; S.M.S. Don L. Milani, Portici; S.M.S. Santagata, Portici; S.M.S. G. Marconi, S. Giorgio a Cremano; S.M.S. E. De Amicis, S.G. Vesuviano; S.M.S. G. Pascoli, Torre Annunziata; S.M.S. D. Colamarino, Torre del Greco; S.M.S. F. D'Assisi, Torre del Greco.; S.M.S. B.V. Romano, Torre del Greco; Liceo Classico Plinio Seniore, Castellammare di Stabia; Liceo Classico De Bottis, Torre del Greco.; Liceo Scientifico Silvestri, Portici; Liceo Scientifico, S. Giorgio a Cremano; Liceo Scientifico Statale, S. Sebastiano al Vesuvio; Liceo Scientifico di Terzigno, Terzigno; Liceo Scientifico A. Nobel, Torre del Greco; I.P.I.A., Portici; I.C.C. S. Anastasia, S. Anastasia; I.T.C. E. Cesaro, Torre Annunziata; I.T.C. F. Degni, Ercolano; I.T.C. L. Einaudi, San G. Vesuviano; I.T.C. L. Sturzo, Castellammare di Stabia.

K. In 1997 GVES launched in Portici and Torre del Greco a series of five consecutive seminars dealing with: (1) Eruption history and problems with eruption predictions; (2) Territory and population; (3) Socio-economic and

cultural effects of Vesuvius Evacuation Plan; (4) VESUVIUS 2000; and (5) Vesuvius risk education. These seminars were followed by people of all ages and were sponsored by *Ufficio Cultura del Comune di Torre del Greco.*

L. In May 1997 we gathered several presidents from the Vesuvius area schools in S.M.S. F. D'Assisi of Torre del Greco for the purpose of defining a project that could help the teachers better educate their students. We subsequently invited other schools for their contributions, and in 1998 GVES published a collection of these works in *Educazione al Rischio Vesuvio* (Dobran, 1998).

M. 2–3 September 2004: GVES and Universities of Naples, Trieste, and Paris V organized a scientific forum on Vesuvius for the purpose of promoting interdisciplinary collaboration on VESUVIUS 2000. Some works presented at this forum are included in this volume.

142. Pucci et al. (2004). Movimento di Cooperazione Educativa (MCE) Gruppo Territoriale Vesuviano (GTV), Via Don Morosini 77, 80056 Ercolano, Napoli. Laboratorio Regionale Città dei Bambini e delle Bambine, Villa Falanga, San Giorgio a Cremano, Napoli.

143. Di Donna and Sbarra (2004).

144. Pucci et al. (2004).

145. Mitchem (1994).

146. NAE (2002, pp. 14–23).

147. Protezione Civile (1995).

148. The Italian volcanologists promoted their Vesuvius Evacuation Plan (Protezione Civile, 1995) within the national and European Union governments in 1995. This plan assumes that an eruption of Vesuvius can be predicted at least 2 weeks before and that in this time frame about 600 000 people can be evacuated from the area and resettled all over Italy. This plan fails on scientific, engineering, socio-political, and economic grounds.

The evacuation plan is scientifically unfeasible because the most probable and maximum future volcanic events in the Vesuvius area are not justified; the threshold limits of premonitory parameters which are used for issuing different alarm and evacuation orders are subjective; and the plan does not delegate the responsibilities for eruption predictions nor evacuations. The engineering reliability of the plan is not justified because it does not account for the functioning of communication and transportation systems preceding and during a volcanic crisis (traffic flow, electrical power, telephones, fuel distribution, transport vehicles along escape routes, railway tracks and signals, and so on); exit modalities from towns (who leaves first); nor for the effects of earthquakes and ground deformation which will produce collapses of buildings and bridges and non-operability of evacuation routes. The socio-political reliability is not justified because the local and national political effects, 'destruction' of Vesuvian culture, consultation and decision by the population to remain or leave the area, and speculation of the territory caused by the evacuation of people to faraway places have not even been addressed. The economic reliability of the plan has not been calculated, such as the cost of a false alarm, cost of evacuation and re-entry, cost to avoid speculation and protect the area during and after an

evacuation, cost to maintain command and control centers, cost associated with host regions which would have to house the evacuees for an undetermined time. Vesuvius Evacuation Plan is unreliable because it was produced by technologically illiterate individuals.

Considering that there are hundreds of thousands of people at risk in the Vesuvius area who are very skeptical about any proposed plan for the territory, it is essential that a volcanic risk mitigation plan be first thoroughly debated by professionals and population before being implemented. Such a plan should be based on interdisciplinary systems integration and it cannot be left in the hands of special interest groups whose aims are inconsistent with the best interests of several million people in the area. Vesuvius Evacuation Plan was politicized in 1995 in order to counteract the interdisciplinary VESUVIUS 2000 initiative, and ever since its proponents (*Gruppo Nazionale per la Vulcanologia, Osservatorio Vesuviano, Protezione Civile, Istituto Nazionale di Geofisisca e Vulcanologia*) have refused to discuss it publicly. This plan is unreliable from the scientific, social, cultural, and economic perspectives and is institutionalizing technological ignorance.

149. See Chapter 1 (Dobran, 2006).
150. NAE (2002, p. 53).
151. Ibid., p. 72.
152. Joss (1998).
153. The construction of Central Artery and Tunnel Project in Boston is a good example how the public, engineers, and construction industry collaborated on one of the most important and largest infrastructure projects in the United States. This 13 billion dollar project required not only the solution of many unique technological problems, but also the involvements of politicians, environmentalists, and the public. Federal, state, and local governments, as well as numerous local interest groups, had their voices in shaping the realization of this project (Hughes, 2003, pp. 168–170; Chandra and Ricci, 2000).

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APPENDIX: MY JOURNEY TO ..... VESUVIUS (IL MIO VIAGGIO ..... AL VESUVIO)

My Journey ... to Vesuvius (*Il mio viaggio ... al Vesuvio*) is a work (cartoon) produced by the students of the intermediate school Orazio Comes in Portici during the 2004–2005 school year.

The cartoon describes a journey of a group of intermediate school students of Portici where their teacher explains mythology, geography, history, architecture, and volcanic risk of the Vesuvius area. Several important events of this area are

explained through the transcendent qualities of some of the personalities of this territory.

The journey begins (cartoon p. 2) with the teacher explaining some characteristic features of Vesuvius: A mountain that is an active volcano, its dimensions, characteristics of material erupted from the crater, and the volcano's last activity in 1944.

Pages 3 and 4 of the cartoon narrate the birth of the volcano according to the traditional mythology. While listening to the nymph Leucopetra singing, the two satyrs Sebeto and Vesevo fell in love with her. As they approached her the nymph became frightened and threw herself into the sea where she turned into stone. Despaired that they could not reach their loved one, Sebeto began to cry and turned into a river of the same name, while Vesevo caught fire and began erupting lava and thus became the volcano Vesuvius.

On p. 5 of the cartoon the teacher explains to the students that the Romans were not aware that Vesuvius is a volcano, but a mountain with a fertile soil for planting grapes and vegetables. In the first century B.C. the Roman gladiator Spartacus and his comrades found a refuge on Vesuvius after having escaped from the nearby gladiator training camp at Capua. On the mountain, the gladiators resisted the siege of a Roman army and were able to escape to freedom.

The Roman life around Vesuvius is described on cartoon pp. 6 and 7. In the first century of common era, the inhabitants of Pompeii, Stabiae, and Herculaneum were enjoying a tranquil life and dividing their time between the forum, baths, and school, without being aware of the looming danger above them.

Page 8 of the cartoon focuses attention on the strong earthquake of 62 A.D. that destroyed large parts of Pompeii and other towns, and caused fear among many people in Campania. This earthquake is considered by some as one of the premonitory signals to the strong explosive eruption of 79 A.D. In fact, on 24th August of the same year Vesuvius produced its most famous eruption.

This eruption is described on cartoon pp. 9 and 10, together with the desperate situation of the people attempting to escape from the falling volcanic debris and save themselves under the arched buildings near the coast and other places. An important message on p. 10 is that many people survived the eruption of 79 A.D.

Page 11 of the cartoon is dedicated to the naturalist Pliny the Elder, the commander of the Roman fleet in Misenum, who during the eruption of 79 A.D. was attempting to help the stricken population, but could not land his boats close to the volcano. He landed in Stabiae instead and died there from volcanic exhalations. This eruption was named in the honor of his nephew who described it and is called the 'plinian eruption'. Although the origin of Portici is unknown, it is known that in Roman time this area near Herculaneum served as a recreation spot for Roman nobility.

Following the plinian eruption of 79 A.D., Vesuvius produced at least two more strong eruptions, and in particular the one on 16 December 1631. This eruption is referred to as the 'subplinian eruption' to distinguish it from the one of 79 A.D. which was much more energetic (p. 12 of cartoon). The eruption of 1631 destroyed much of the coastal region of Vesuvius with 7 pyroclastic and mud flows, with the town of Portici being destroyed completely.

The eruption of 1631 produced more than 4000 fatalities and led the Spanish Viceroy Emmanuel Fonseca to erect a stone memorial in Portici, depicting the characteristics of this eruption. This epitaph invites the citizens to escape without delay when Vesuvius begins grumbling and shaking the ground (cartoon p. 13).

Pages 14–16 of the cartoon are dedicated to the travelers of Grand Tour. In 1600s and 1700s these travelers were the European nobles who explored Vesuvius as a part of the education of the geography, customs, and natural phenomena of their neighboring nations. The Grand Tour travelers had to traverse very difficult paths to reach the crater of Vesuvius, because during these centuries the volcano was often erupting with lava flows.

On p. 16 of the cartoon the attention is focused on Grand Tour personalities Hamilton, Mozart, Chateaubriand, Goethe, and others who, with their celebrated testimonies, produced their visions of the volcano and understood why the people of this land have refused to leave it.

The Royal Palace of Portici was constructed by the Bourbon king Charles III (cartoon p. 17), following the rediscovery of the theater of Herculaneum by Prince d'Elboeuf in 1700s (p. 18). The king decided to build the palace at this location so he can closely follow the excavations at Herculaneum and, later, at Pompeii and house the treasures from these Roman towns buried by Vesuvius in 79 A.D.

Page 19 of the cartoon describes how the sovereign responded to his advisors who were discouraging him to construct a palace in a place so close to the volcano. Charles III responded that he trusts the protection from San Gennaro (upper left), and thus began the construction of Vesuvian villas by his nobles who wanted to stay close to the king. One of the most famous of these villas was constructed during the eighteen century by Prince d'Elboeuf (lower center) for holding the treasures excavated at Herculaneum.

Page 20 of the cartoon refers to the nineteen century when a funicular railway was constructed for transporting the travelers from the lower slopes to the crater of Vesuvius.

The twentieth century began with a strong explosion of Vesuvius in 1906 (cartoon p. 21) when the volcano produced ash and mud flows for several days. The last eruption of the volcano occurred in 1944 during World War II, following the liberation of the territory by the Anglo–American forces from German occupiers (cartoon p. 22).

Finaly, pages 23 and 24 of the cartoon present the current situation in the Vesuvius area: Enormous growth of population after World War II and abusive construction of buildings too close to the crater to satisfy the population growth. Today, there are about 600 000 people exposed to the high risk of eruptions and the only official solution to the problem is deportation of the people to distant Italian provinces. This plan does not account for the people having only a very short time to escape with the unreliable transportation systems. The final vignette on p. 24 shows a muttering Vesuvius who is happy for finally remaining alone after all of the people have left from his slopes.

Il mio viaggio ... al Vesuvio è un lavoro realizzato dagli studenti della S.M.S. Orazio Comes, durante l'anno scolastico 2004–2005, dove il Vesuvio è presentato

nei suoi molteplici aspetti: storici, scientifici, geografici, culturali. Questi aspetti sono rappresentati con una serie di immagini scaturite da quanto gli studenti hanno appreso nel loro studio del vulcano e del suo ambiente, sugli eventi importanti e tramite le qualità trascendenti dei personaggi illustri del territorio vesuviano. Il contenuto del fumetto spazia attraverso queste tematiche: il mito della nascita del vulcano; Bacco che rappresenta la fertilità della terra; Spartaco che impersona la lotta dell'uomo per liberarsi dall'oppressione romana; la non consapevolezza degli abitanti della pericolosa natura del vulcano e un primo segno del pericolo durante il terremoto del 62 d.C.; i segni premonitori che portarono alla grande eruzione del 79 d.C.; la sconvolgente eruzione del vulcano il 24 agosto e gli effetti sulle città che circondavano il vulcano; il coraggio di Plinio il Vecchio che aiuta le popolazioni in pericolo e le lettere del nipote che immortalano suo zio e descrivono per i posteri la prima eruzione vulcanica; la tremenda eruzione del 16 dicembre 1631 che devastò i paesini lungo la costa vesuviana, lo sforzo del regno spagnolo di aiutare la gente e farle capire, tramite un'epigrafe su lapide, come reagire quando il vulcano riprende la sua mortale attività; i viaggiatori del Gran Tour al tempo dell'illuminismo che, scoprendo la natura scientifica del vulcano tramite grandi personaggi, come Hamilton e Goethe, la diffondono nel mondo; la riscoperta delle vecchie cittadine sepolte di Ercolano e Pompei nel 700 e la diffusione dell'importanza di questa scoperta nel mondo occidentale; la sucessiva nascita delle Ville Vesuviane del Miglio d'Oro; l'importanza del santo napoletano Gennaro protettore delle genti vesuviane dalle ire del vulcano; la prima grande eruzione del ventesimo secolo e lo sforzo del governo liberale per arginare i suoi effetti sulla popolazione; l'ultima eruzione del 1944 che si è verificata durante l'occupazione delle forze alleate nella seconda guerra mondiale; gli insediamenti di centinaia di migliaia di persone sulle pendici del vulcano nel dopoguerra ed il poco utile piano di evacuazione destinato a maneggiare circa un milione di persone esposte all'altissimo rischio vulcanico. Attraverso tutto ciò gli alunni pervengono alla scoperta delle loro radici e della loro precaria convivenza con il vulcano.

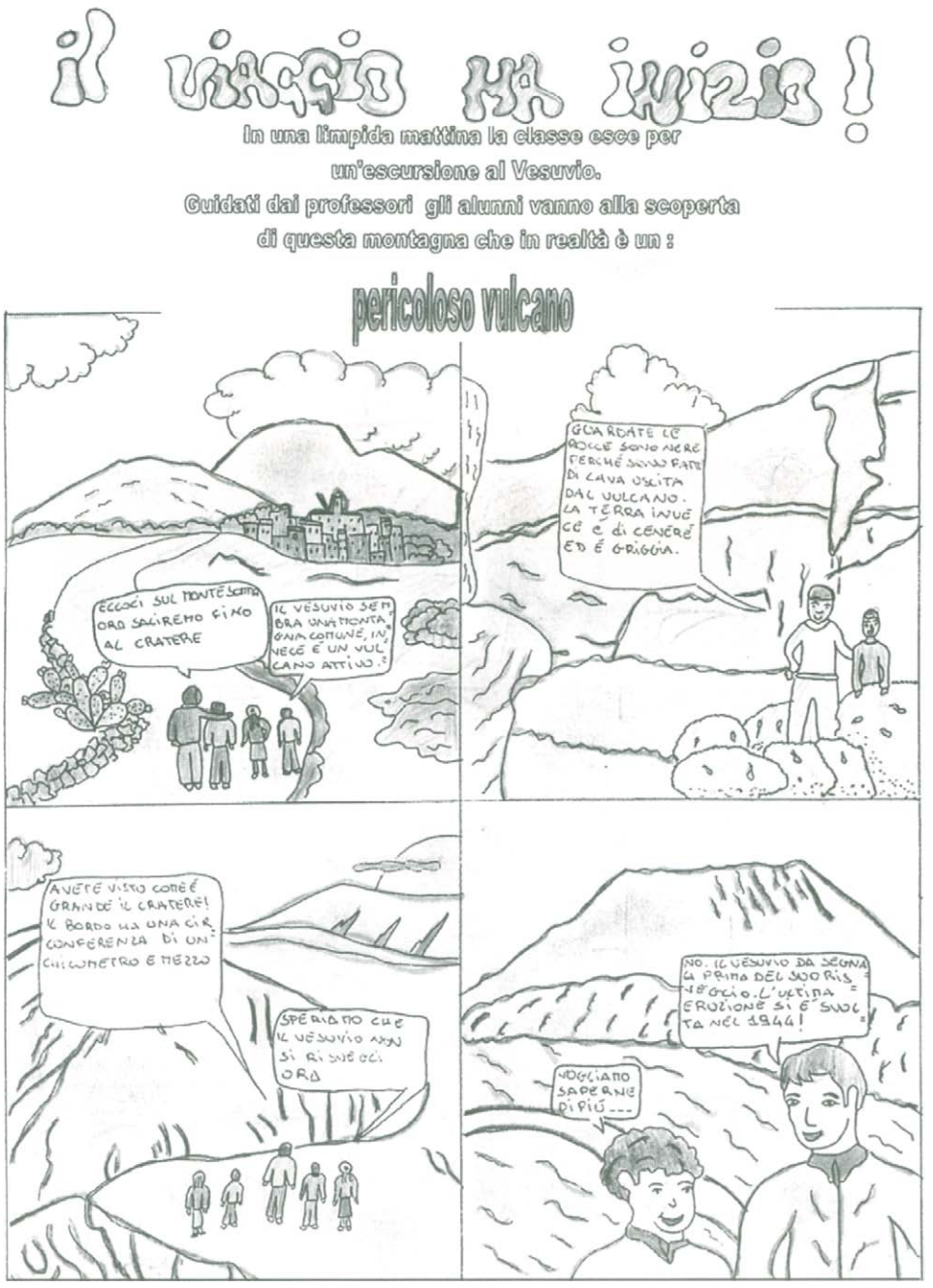
Il lavoro rientra nei progetti 'La scuola adotta un monumento', condotto in collaborazione con la fondazione 'Napoli 99', e 'Educazione al Rischio Vesuvio', con coordinatrice Annamaria Imperatrice e collaboratori Pina Donatiello, Nicola Ciobbo e Franca Vigilante.

Il mio viaggio .....
al Vesuvio

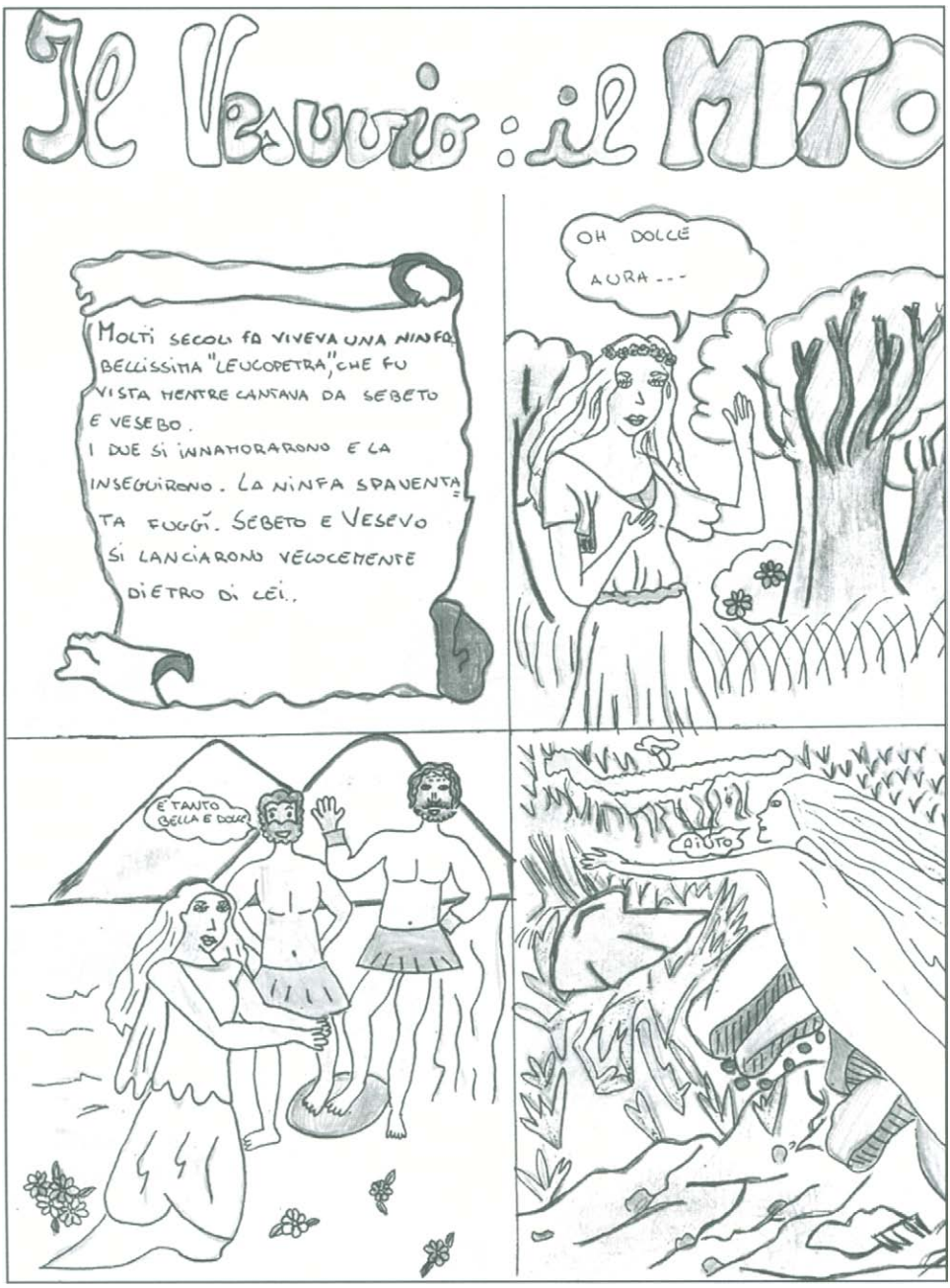
Napoli - L'eruzione del Vesuvio

S.M.S. "O. Comes"
anno scolastico 2004-2005
a cura delle classi 1°E e 2°E

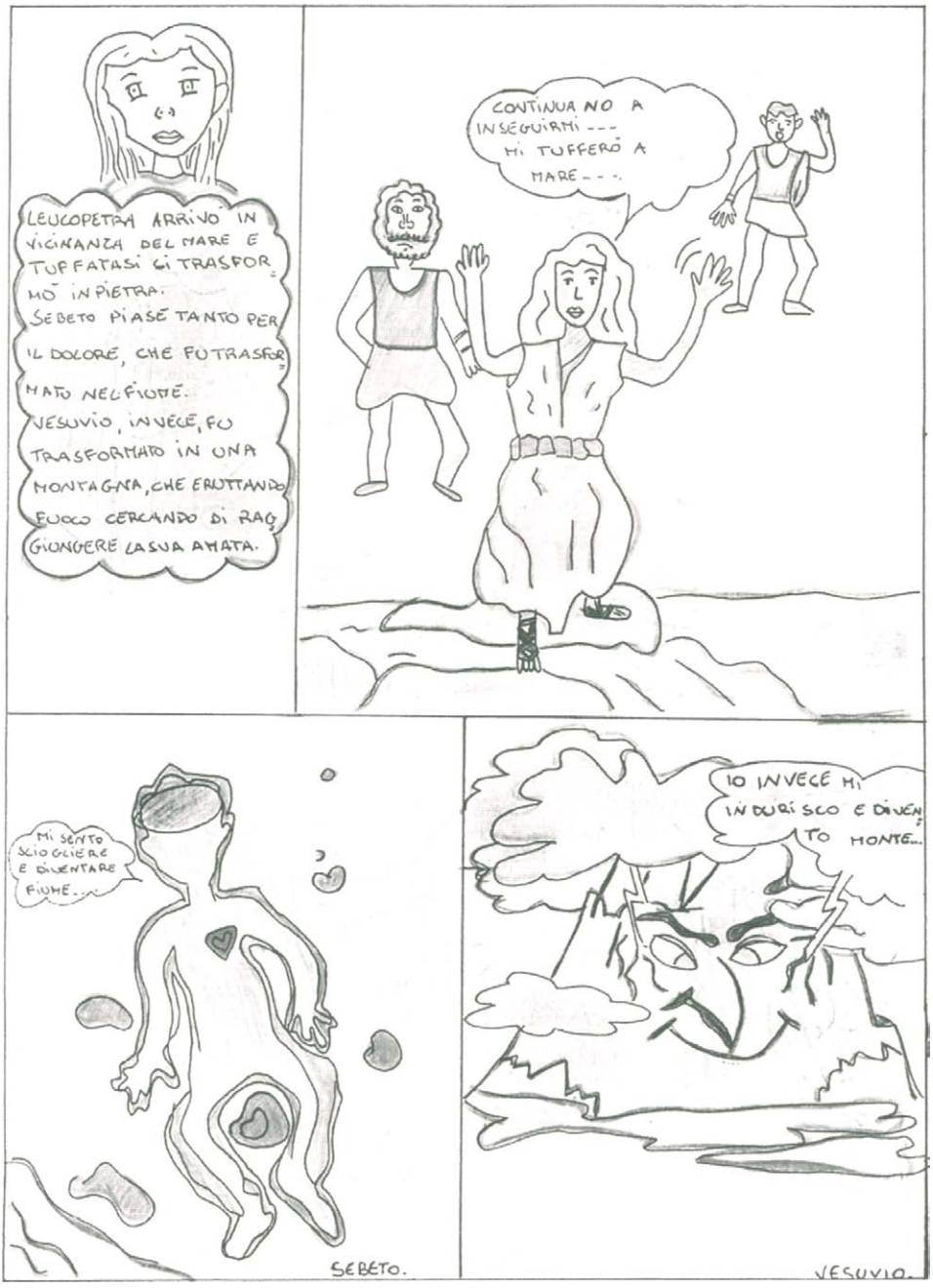
Cartoon P.1


il viaggio ha inizio!
In una limpida mattina la classe esce per un'escursione al Vesuvio.
Guidati dai professori gli alunni vanno alla scoperta di questa montagna che in realtà è un :
pericoloso vulcano
ECCOCI SUL MONTE SOMMA ORA SALIREMO FINO AL CRATERE
IL VESUVIO SEMBRA UNA MONTAGNA COMUNE, INVECE È UN VULCANO ATTIVO.
GUARDATE LE ROCCE SONO NERE PERCHÉ SONO FATTE DI LAVA USCITA DAL VULCANO. LA TERRA INVECE È DI CENERE ED È GRIGIA.
AVETE VISTO COME È GRANDE IL CRATERE! IL BORDO HA UNA CIRCONFERENZA DI UN CHILOMETRO E MEZZO
SPERIAMO CHE IL VESUVIO NON SI RISVEGLI ORA
NO. IL VESUVIO DA SEGNALI PRIMA DEL SUO RISVEGLIO. L'ULTIMA ERUZIONE SI È SVOLTA NEL 1944!
VOGLIAMO SAPERNE DI PIÙ ---

Cartoon P.2


Il Vesuvio: il MITO
MOLTI SECOLI FA VIVEVA UNA NINFA BELLISSIMA "LEUCOPETRA", CHE FU VISTA MENTRE CANTAVA DA SEBETO E VESEBO. I DUE SI INNAMORARONO E LA INSEGUIRONO. LA NINFA SPAVENTATA FUGGÌ. SEBETO E VESEVO SI LANCIARONO VELOCEMENTE DIETRO DI LEI.
OH DOLCE AURA---
E' TANTO BELLA E DOLCE
AIUTO!

Cartoon P.3


LEUCOPETRA ARRIVÒ IN VICINANZA DEL MARE E TUFFATASI SI TRASFORMÒ IN PIETRA.
SEBETO PIANSE TANTO PER IL DOLORE, CHE FU TRASFORMATO NEL FIUME.
VESUVIO, INVECE, FU TRASFORMATO IN UNA MONTAGNA, CHE ERUTTANDO FUOCO CERCANDO DI RAGGIUNGERE LA SUA AMATA.
CONTINUANO A INSEGUIRMI --- MI TUFFERÒ A MARE---.
MI SENTO SCIOGLIERE E DIVENTARE FIUME...
SEBETO.
IO INVECE MI INDURISCO E DIVENTO MONTE...
VESUVIO.

Cartoon P.4


I ROMANI E IL VESUVIO
Sotto la dominazione romana il Vesuvio non aveva mai eruttato, per cui i romani lo vedevano come montagna fertile su cui c'era uva.
SU DI ESSA SI RIFUGIÒ SPARTACO, FAMOSO GLADIATORE NEL 73 a.C, DISERTÒ E CON UN GRUPPO DI COMPAGNI CERCÒ RIFUGIO SUL VESUVIO.
EGO RETIARIUS SUM VICTOR

Cartoon P.5


LA VITA NELLE CITTÁ ROMANE NEL I S
TRASCORREVA
TRANQUILLA
PRISCILLA UBI
TU ES
ECCE
FORUM
AVE
CORNELIA
AVE

Cartoon P.6


HODIE MAGISTER INTERROGAT
EGO NON HABEO TABULAM CERATAM
EGO PORTAM CANEM SCHOLA
VENIO AB SCHOLA CUM TIBI

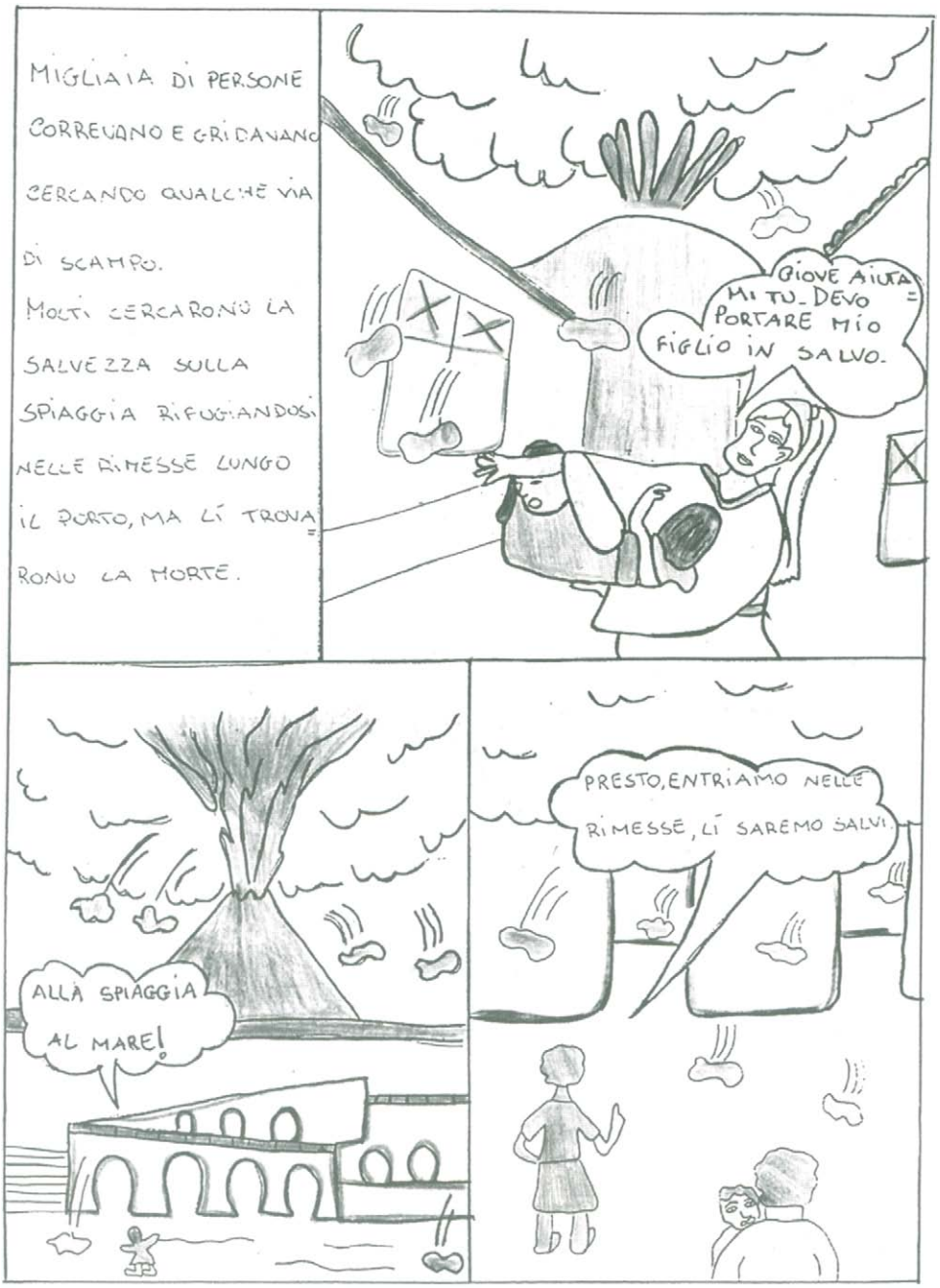
Cartoon P.7


DOPO TANTI ANNI
DI QUIETE, NEL 62d.C
UN TREMENDO
TERREMOTO SCOSSE
LE CITTA' DI
POMPEI E DI ERCOLANO
CI VOLLERO MOLTI
ANNI PER
RICOSTRUIRLE.
AIUTO STA CROLLANDO TUTTO
CRASH
CRASH
FOLVIA, SONO PREOCCUPATA, VEDO TANTE CREPE NEL MURO
ANCH'IO HO PAURA NEL POZZO NON C'ERA ACQUA STAM. ATTINA
NEL 79 d.C.
NEL MESE DI
AGOSTO CI
FURONO
NUMEROSI
SEGNI DEL
PROSSIMO
RISVEGLIO DEL
VULCANO.

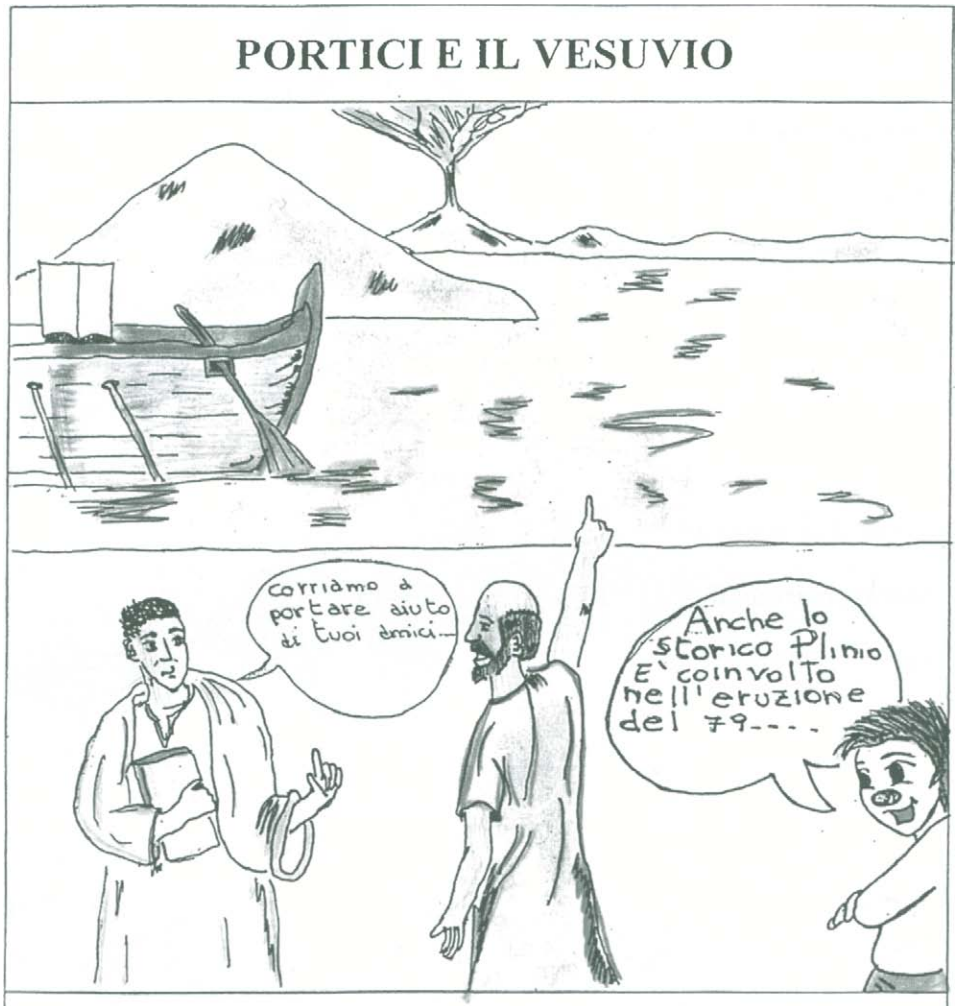
Cartoon P.8

Il 24 agosto, improvvisamente un grosso boato squarciò l'aria.
Il Vesuvio sembrava essersi spaccato in due e una lingua di fuoco scendeva lungo i suoi fianchi.
Un enorme nuvola di fumo si alzò in aria e tutto divenne buio.

Cartoon P.9

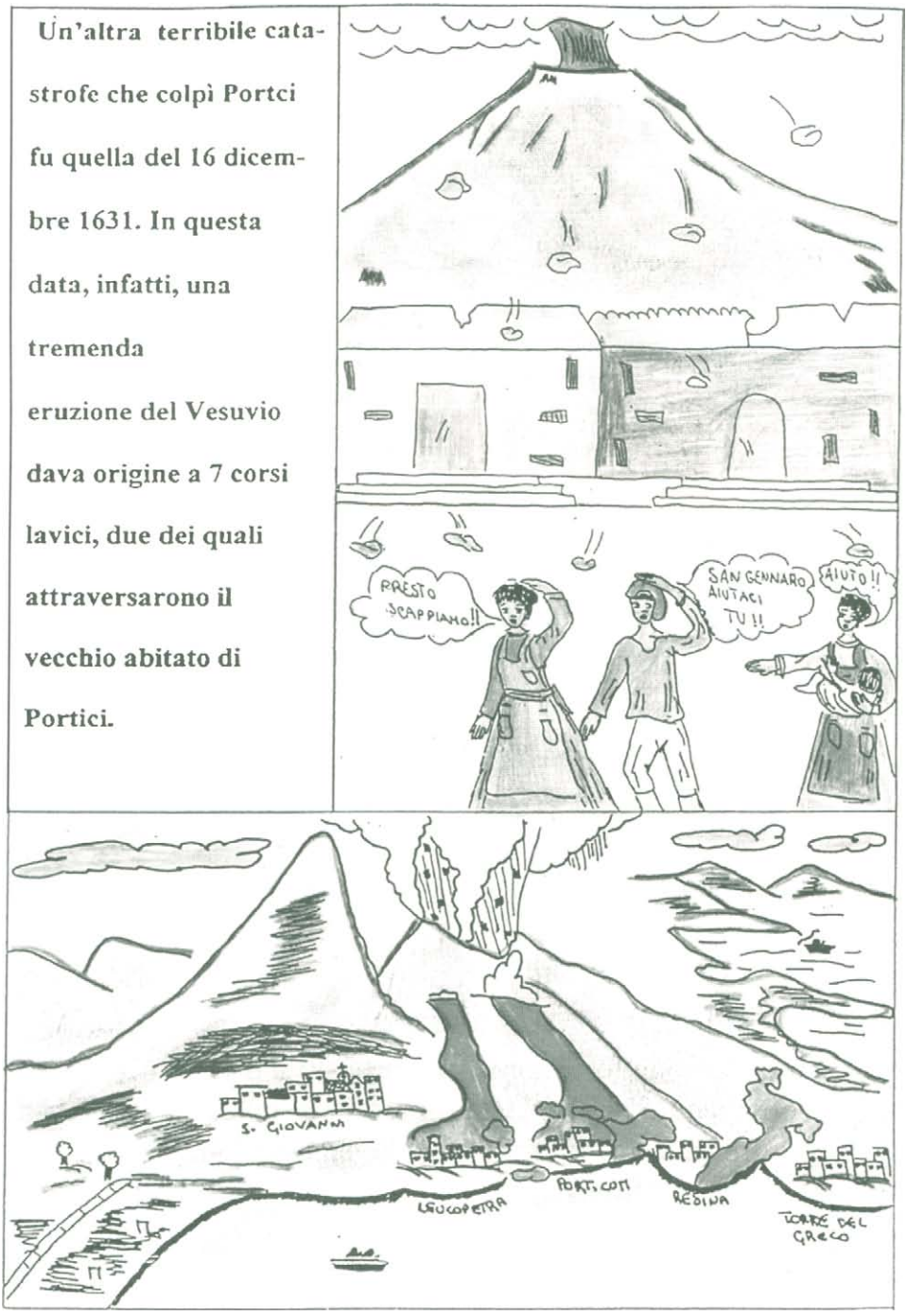

MIGLIAIA DI PERSONE CORREVANO E GRIDAVANO CERCANDO QUALCHE VIA DI SCAMPO. MOLTI CERCARONO LA SALVEZZA SULLA SPIAGGIA RIFUGIANDOSI NELLE RIMESSE LUNGO IL PORTO, MA LÌ TROVARONO LA MORTE.
GIOVE AIUTAMI TU. DEVO PORTARE MIO FIGLIO IN SALVO.
ALLA SPIAGGIA AL MARE!
PRESTO, ENTRIAMO NELLE RIMESSE, LÌ SAREMO SALVI

Cartoon P.10

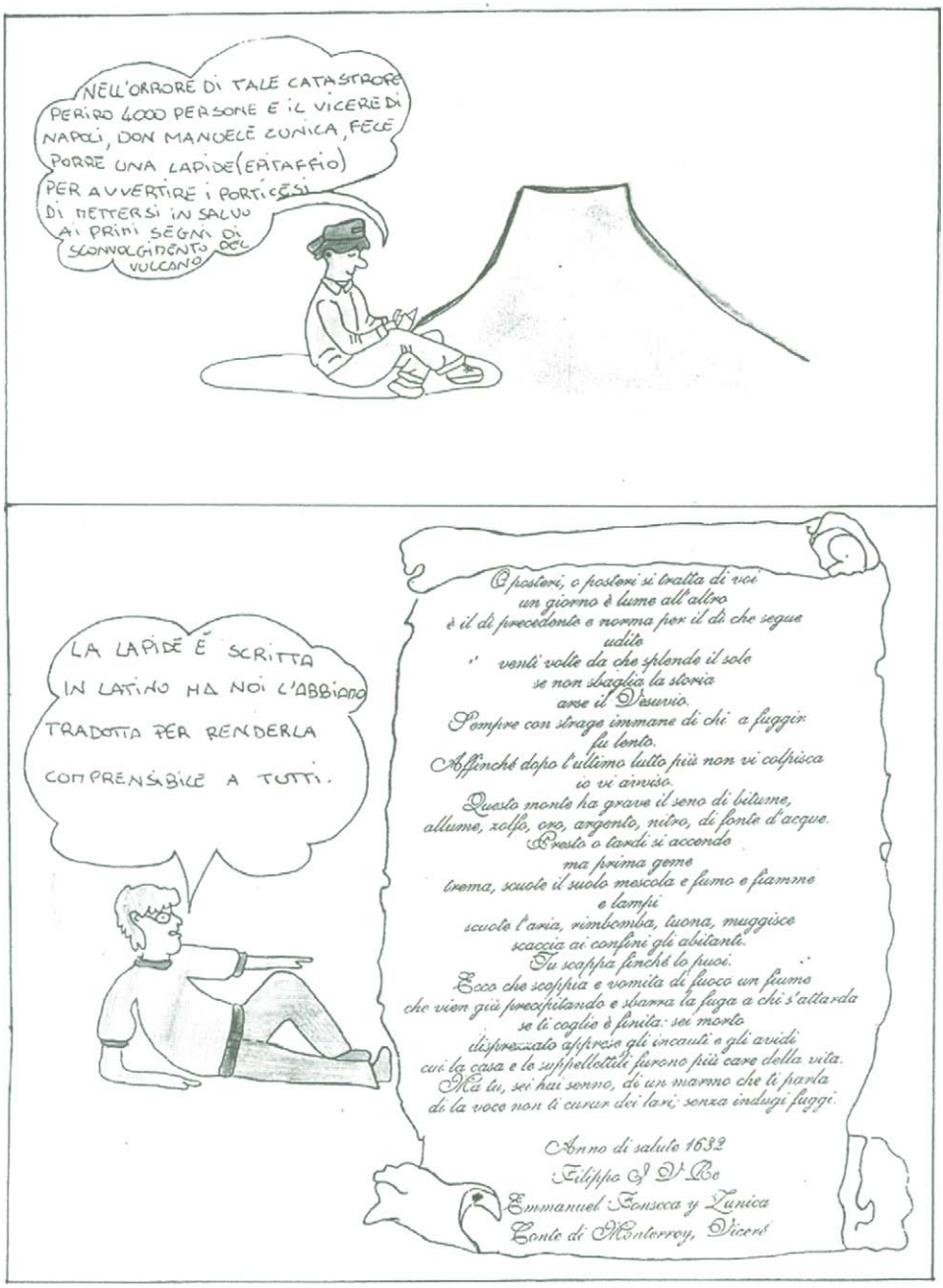


Anche se non ci sono testimonianze certe sulle origini di Portici,la nostra cittadina è stata un luogo di villeggiatura romano.Inoltre,proprio come Ercolano,è stata colpita dall'eruzione del Vesuvio del 79 d.C.

Cartoon P.11


Un'altra terribile catastrofe che colpì Portci fu quella del 16 dicembre 1631. In questa data, infatti, una tremenda eruzione del Vesuvio dava origine a 7 corsi lavici, due dei quali attraversarono il vecchio abitato di Portici.
PRESTO SCAPPIAMO!!
SAN GENNARO AIUTACI TU!!
AIUTO!!
S. GIOVANNI
LEUCOPETRA
PORTICCI
REGINA
TORRE DEL GRECO

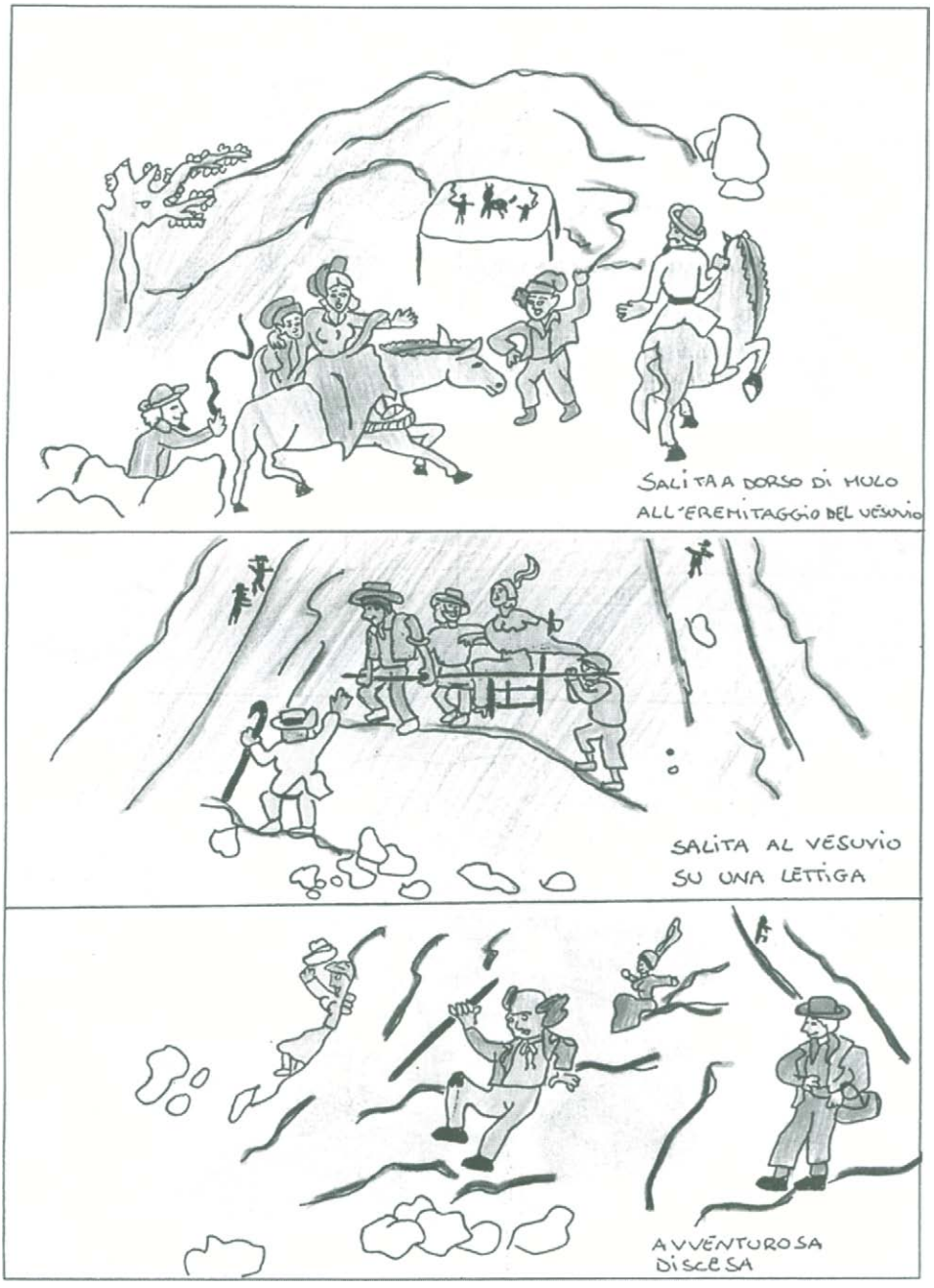
Cartoon P.12


NELL'ORRORE DI TALE CATASTROFE PERIRO 4000 PERSONE E IL VICERE DI NAPOLI, DON MANUELE ZUNICA, FECE PORRE UNA LAPIDE (EPITAFFIO) PER AVVERTIRE I PORTICESI DI METTERSI IN SALVO AI PRIMI SEGNI DI SCONVOLGIMENTO DEL VULCANO
LA LAPIDE È SCRITTA IN LATINO HA NOI L'ABBIAMO TRADOTTA PER RENDERLA COMPRENSIBILE A TUTTI.
O posteri, o posteri si tratta di voi
un giorno è lume all'altro
è il dì precedente a norma per il dì che segue
udite
venti volte da che splende il sole
se non sbaglia la storia
arse il Vesuvio.
Sempre con strage immane di chi a fuggir
fu lento.
Affinché dopo l'ultimo tutto più non vi colpisca
io vi avviso.
Questo monte ha grave il seno di bitume,
allume, zolfo, oro, argento, nitro, di fonte d'acque.
Presto o tardi si accende
ma prima geme
trema, scuote il suolo mescola e fumo e fiamme
e lampi
scuote l'aria, rimbomba, tuona, muggisce
scaccia ai confini gli abitanti.
Tu scappa finché lo puoi.
Ecco che scoppia e vomita di fuoco un fiume
che vien giù precipitando e sbarra la fuga a chi s'attarda
se lì coglie è finita: sei morto
disprezzato apprese gli incauti e gli avidi
cui la casa e le suppellettili furono più care della vita.
Ma tu, se hai senno, di un marmo che ti parla
di la voce non ti curar dei lari; senza indugi fuggi.
Anno di salute 1632
Filippo IV Re
Emmanuel Fonseca y Zunica
Conte di Monterrey, Vicerè

Cartoon P.13

Era di moda fra gli aristocratici europei fare un viaggio in un paese straniero per completare la propria istruzione.
Napoli era una delle città del tour e il Vesuvio ne costituiva una delle attrattive.

Cartoon P.14


SALITA A DORSO DI MULO
ALL'EREMITAGGIO DEL VESUVIO
SALITA AL VESUVIO
SU UNA LETTIGA
AVVENTUROSA
DISCESA

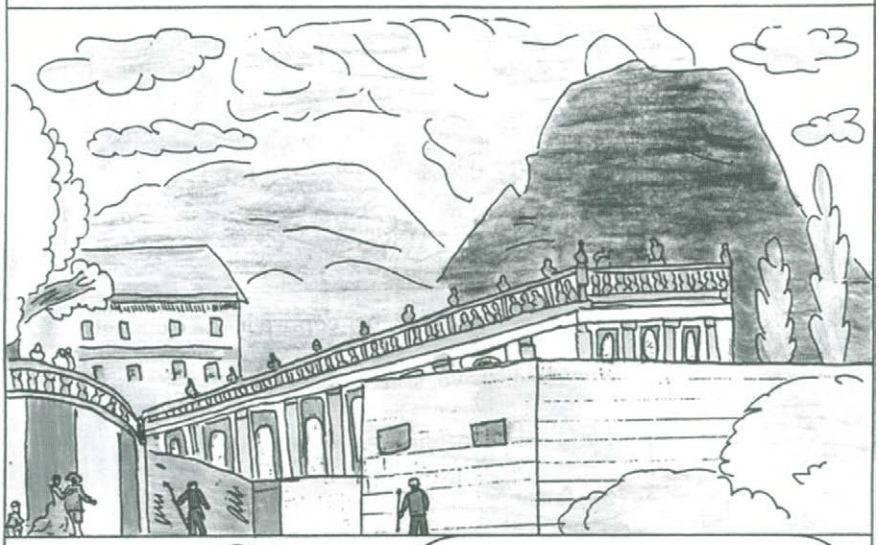
Cartoon P.15

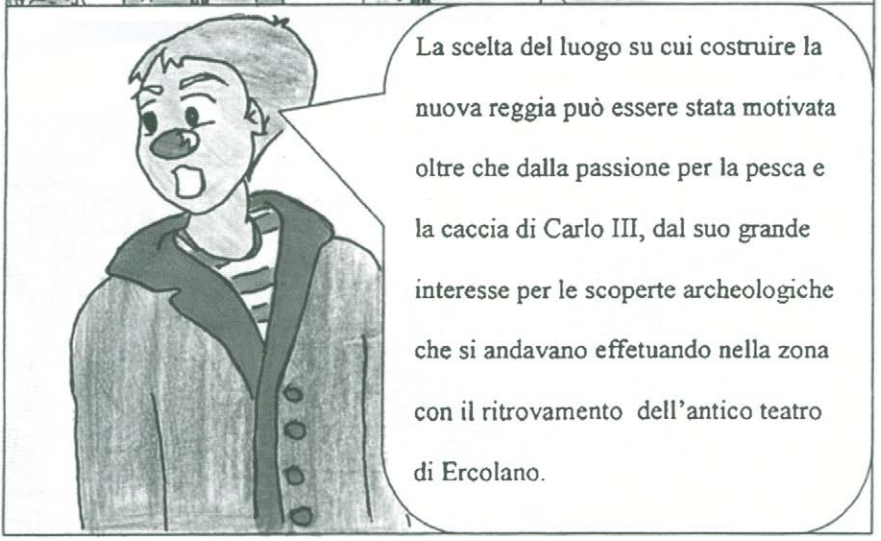

FRA I VIAGGIATORI PIÙ FAMOSI RICORDIAMO: LORD HAMILTON MOZART - CHATEAUBRIAND - GOETHE METTERNICH - DUMAS - DICKENS - TUTTI HANNO LASCIATO DESCRIZIONI DEL LORO VIAGGIO...
ZZZ
CARO LORD HAMILTON È PRONTO PER L'ESCURSIONE AL VESUVIO
CERTAMENTE
SE NESSUN NAPOLETANO VUOLE ANDARSENE DALLA SUA CITTÀ, PONSI PUÒ FARGLIENE CARICO VI FOSSERO ANCHE DUE OTRE VESUVI NELLE VICINANZE.
GOETHE

Cartoon P.16

IL SETTECENTO

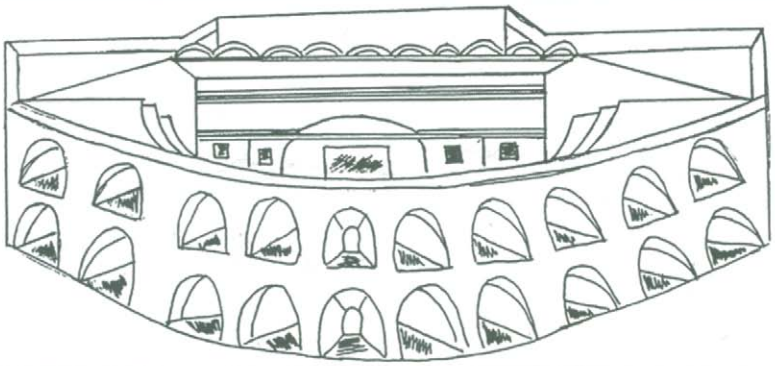
Le condizioni di vita dei cittadini di Portici migliorarono notevolmente nel 700. Il re Carlo III di Borbone decise di far costruire una reggia a Portici, trasformando in "Reale villa di Portici" il casale concedendo anche il privilegio della esenzione fiscale.





Cartoon P.17

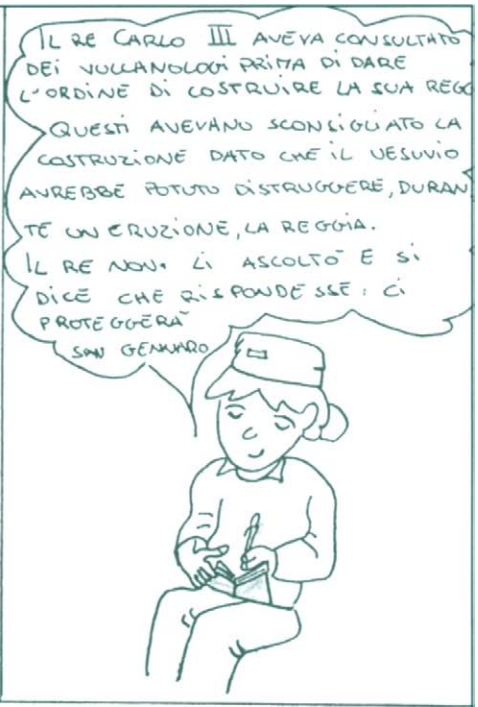
Agli inizi del 700 durante lo scavo di un pozzo per la ricerca dell'acqua, un contadino aveva trovato dei pezzi di marmo e delle statue. Il principe d' Elboeuf che comandava le truppe austriache durante la dominazione austriaca su Napoli, comprò il terreno del contadino e usò il pozzo per trarne statue e reperti.



Nel 1711 il principe, per coprire la sua campagna illegale di scavo, si fece costrire una villa vicino al porto del Granatello su progetto di Ferdinando Sanfelice.

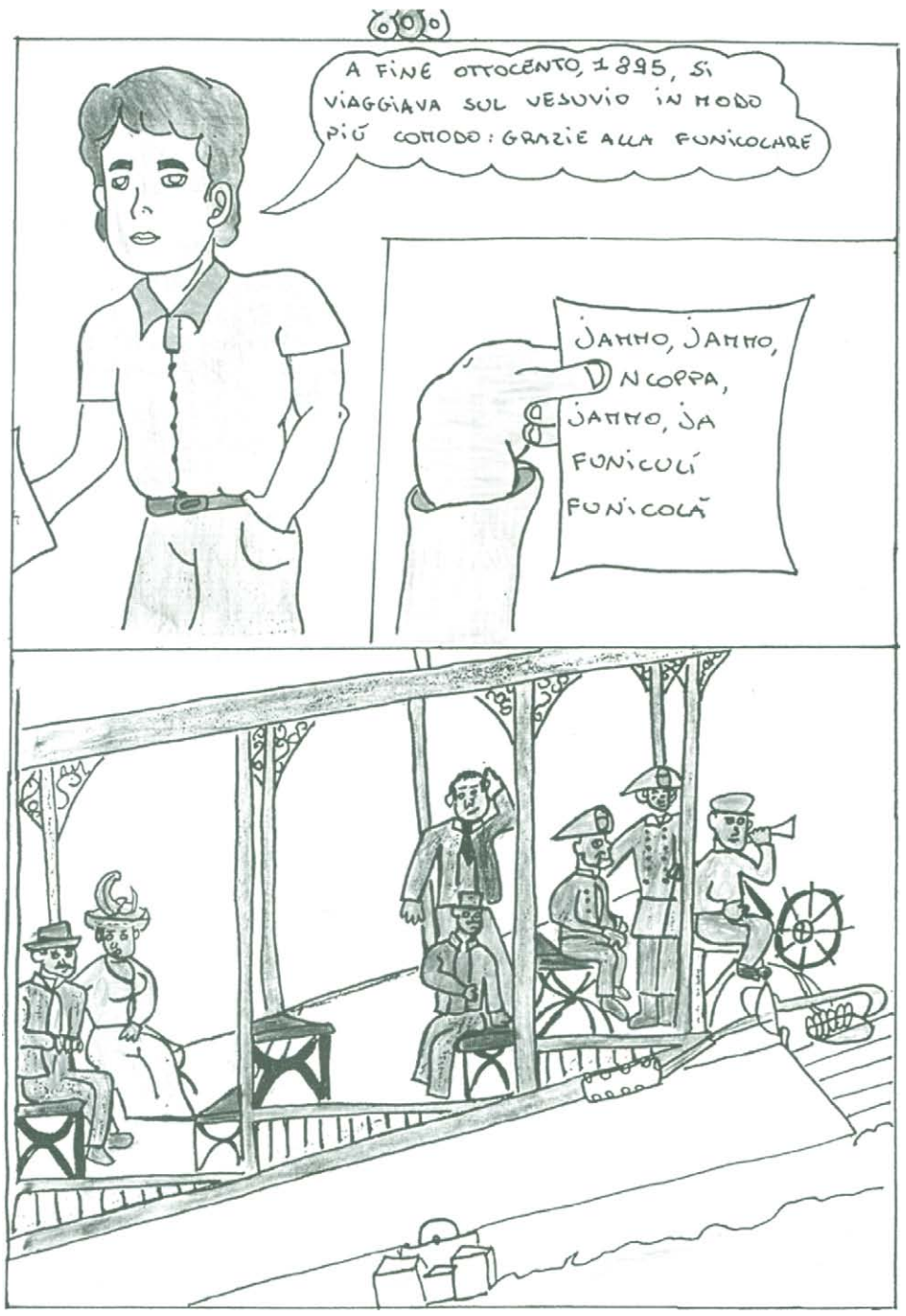
Cartoon P.18

SAN GENNARO AL PONTE D. MADDALENA.



IN EFFETTI LA REGGIA E LE VILLE VESUVIANE NON SONO STATE DISTRUTTE DAL VESUVIO... MA OGGI SONO IN DEGRADO.

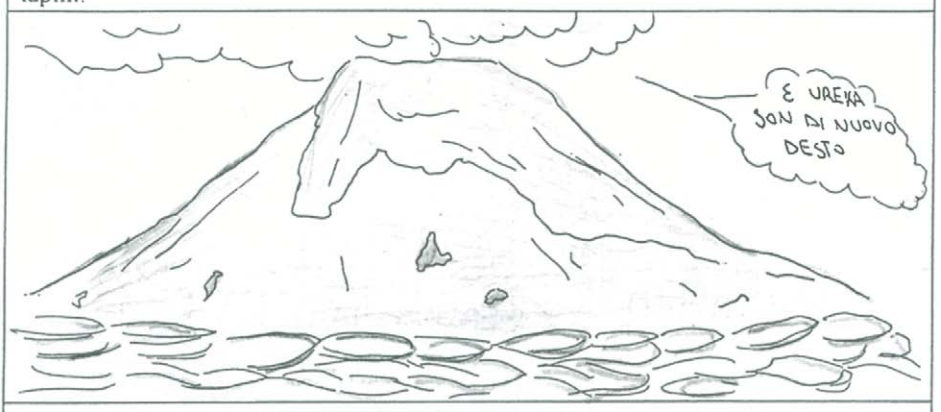
Cartoon P.19

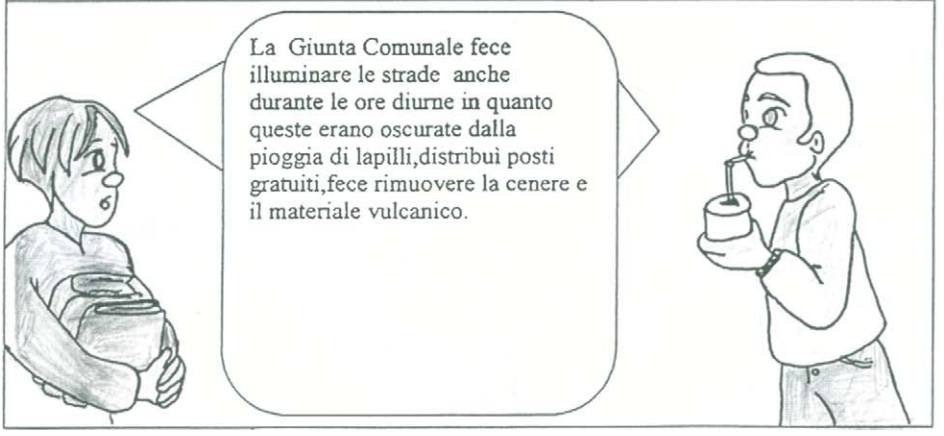

A FINE OTTOCENTO, 1895, SI VIAGGIAVA SUL VESUVIO IN MODO PIÚ COMODO: GRAZIE ALLA FUNICOLARE
JAMMO, JAMMO, 'NCOPPA, JAMMO, JA FUNICULÍ FUNICOLÃ

Cartoon P.20

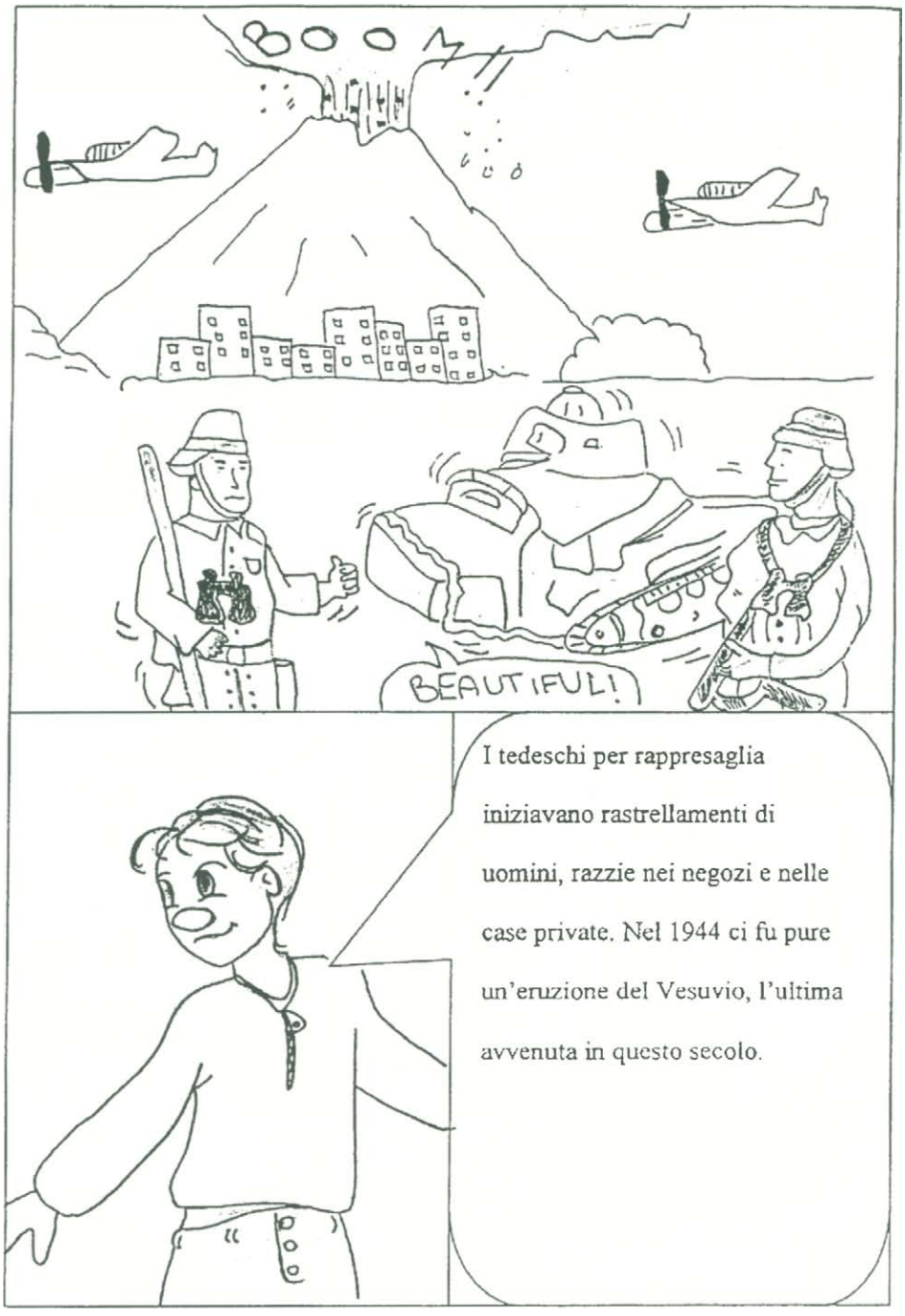
IL NOVECENTO

Il nuovo secolo inizia con una tragedia.Il 4 aprile si ebbe una forte eruzione del Vesuvio. Durante quattro giorni l'eruzione raggiunse la fase più acuta che portò al crollo del cocuzzolo e delle pareti del cono Vulcanico accompagnato da un boato spaventoso avvertito in tutta la regione. La nostra zona fu colpita da una violenta pioggia di cenere e lapilli.





Cartoon P.21


BOOM
BEAUTIFUL!
I tedeschi per rappresaglia iniziavano rastrellamenti di uomini, razzie nei negozi e nelle case private. Nel 1944 ci fu pure un'eruzione del Vesuvio, l'ultima avvenuta in questo secolo.

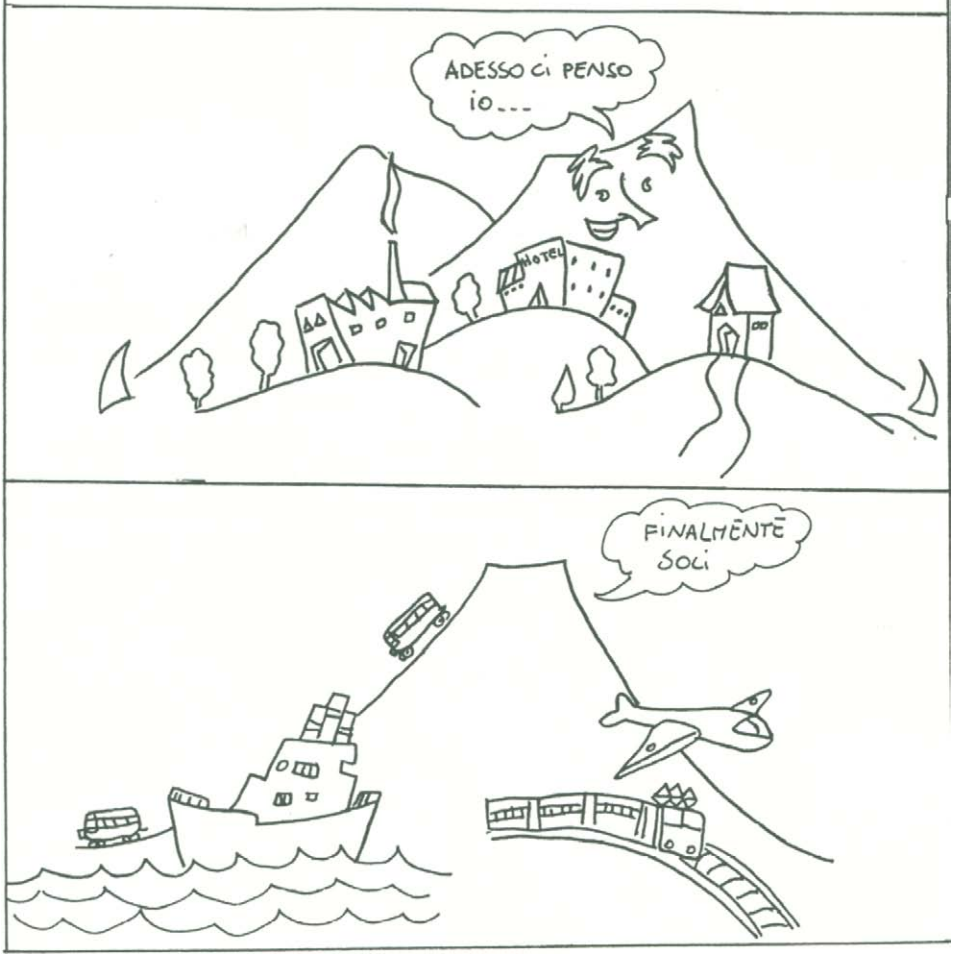
Cartoon P.22

Dell'ultima eruzione del Vesuvio sono passati 61 anni.
Le cittadine vesuviane in questi anni si sono ingrandite in maniera enorme.
Senza tener conto di trovarsi in una zona ad alto rischio, è stato permesso di costruire anche alle falde del vulcano.

Oggi circa 600.000 persone vivono in una delle zone più pericolose del mondo! E come unica soluzione al rischio è stato preparato un piano che prevede l'allontanamento della popolazione.

Cartoon P.23

Secondo il piano d'evacuazione in caso d'eruzione tutte queste persone dovrebbero lasciare le loro case e ordinatamente essere "deportate" in campi di raccolta. Non si tiene conto che il tempo a disposizione prima dell'eruzione potrebbe essere di solo poche ore e che una città come la nostra, che si blocca anche nelle ore di punta, in caso di emergenza diventerebbe ingovernabile!



Colour Plate Section

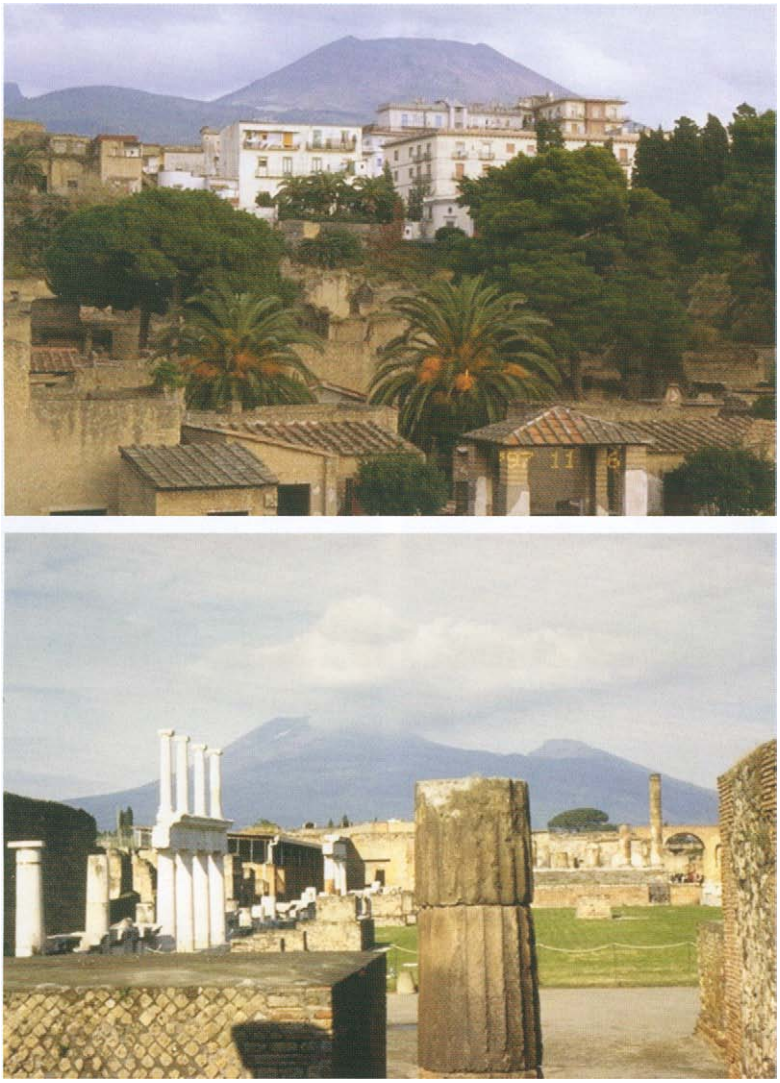


Plate 1. (Fig. 2.2). Top: Ruins of Herculaneum in the foreground and modern city of Ercolano and Vesuvius in the background. Bottom: View of Vesuvius (to the left) and Monte Somma relief (to the right) from the forum of the ruins of Pompeii.

Plate 2. (Fig. 2.3). Drawings of Vesuvius and its environment produced by the pre-school children of Scuola Materna L. Bertelli in Portici. From students' exhibition at Museo Nazionale Ferroviario di Pietrarsa, 16 December 1996, Portici.

Plate 3. (Fig. 2.4). A sampling of educational projects on Vesuvius produced by the students of the intermediate school Orazio Comes in Portici. The projects include volcanic risk, composition and products of Vesuvius, flora, fauna, and park of Vesuvius, Grand Tour travelers, and Vesuvian villas and other cultural patrimonies. From top left in clockwise direction: Students' school exhibition, June 1996; exhibition at Museo Nazionale Ferroviario di Pietrarsa, 16 December 1997, Portici; exhibition at S.M.S. Don Milani, 16 December 1999, Portici; Grand Tour travelers, December 2004; Vesuvius seen from the port of Portici (Granatello); stone memorial in portici[119] erected in 1632 following the subplinian eruption in 1631; class 2E with the teacher Annamaria Imperatrice on the right, December 2004; students from Comes and Don Milani, exhibition at Museo Nazionale Ferroviario di Pietrarsa, 16 December 1998, Portici.

Plate 4. (Fig. 2.5). A sampling of educational projects on Vesuvius produced by the intermediate school students of Istituto Comprensivo Statale Francesco d'Assisi of Torre del Greco. From top left in clockwise direction: Earth's internal structure, 1995; Pliny the Younger letters, 1996; eruptions of Vesuvius, 1997; lava flow of 1794 destroying Torre del Greco, 1998; teacher Gelsomina Sorrentino (center) with her students, 2005; students and teachers associated with the special student project discussed in the text.

Plate 5. (Fig. 2.7). Sample of students' activities at Rocco Scotellaro, 1995–1998. From top left in clockwise direction: Construction of a model of Vesuvius and magic cube, aided by the teachers Elvira Maddaluno (center) and Gianfranco Gambardella (top right); music group playing the songs 'VESUVIUS 2000' and '2000 Vesuvians on a train'.

Plate 6 (Fig. 2.10a). Moments from the educational activities on the territory promoted through GVES. From top left in clockwise direction: Flavio Dobran with Arianna Montrone at Granatello of Portici with the boat Giobe in the background, 24 August 1995; VESUVIUS 2000 exhibition at Villa Campolieto, 16 December 1995; teachers Linda Rosi from S.M.S. Diego Colamarino, Torre del Greco, and Anna Ibello from S.M.S. Don Milani, Portici, with their students presenting works on Vesuvius, 31 October 1997; primary, intermediate, and secondary school students participating at the exhibition held at Museo Nazionale Ferroviario di Pietrarsa, 16 December 1997, Portici; Flavio Dobran with students and teachers of Liceo Plinio Seniore of Castellamare di Stabia on Vesuvius, 3 November 1997.

Plate 6 (*continued*) (Fig. 2.10b). Moments from the educational activities on the territory promoted through GVES. From top left in clockwise direction: Flavio Dobran with Alan Alda from Scientific American Froniers, filming on Vesuvius, August 2004; with Giuseppe Luongo, with Vesuvius in the background, c. 1997; with Anna Ibello and Annnamaria Trotta at an exibition at San Sebastian al Vesuvio, 17 May 1998; with Giorgio Formicola above the crater of Vesuvius, 25 June 1998; with Pina, Luigi, and Massimo D'Anniello in Boscotrecase, 5 May 1999; with organizers of the 1998 student exibition at Museo Nazionale Ferroviario di Pietrarsa.

Plate 6 (*continued*) (Fig. 2.10c). Moments from the educational activities on the territory promoted through GVES. From top left in clockwise direction: Flavio Dobran with Associazione FIDAPA members, Gragnano, 9 January 2003; with students and teachers of Liceo Scientifico Don Milani, Gragnano, 7 January 2003; receiving an award from the secondary school Liceo Clasico de Bottis, Torre del Greco, 22 January 2004; with students and teachers of secondary school Istituto Tecnico Commerciale P. Levi, Portici, 21 January 2004; students and teachers of secondary school Luigi Sturzo, Castellammare di Stabia, 2004.

Plate 6 (*continued*) (Fig. 2.10d). Moments from the educational activities on the territory promoted through GVES. From top left in clockwise direction: VESUVIUS 2000 forum 2004, Villa Campolieto, 2-3 September 2004; Valerio di Donna lecturing; Ida Mascolo, Flavio Dobran, Gelsomina Sorrentino, Antonio Nisida, Arturo Montrone, Leandro Limoccia, Pietro Sarnacchiaro; forum participants in front of the Marine gate at Pompeii, with Tulio Pucci wearing a white hat; forum participants; in the group picture some individuals in the front row are Gennaro di Donna, Vincenzo de'Novellis, Giuseppe Luongo, Concetina Nunziata, and Annamaria Scorza; Annamaria Imperatrice and Flavio Dobran at the forum of Pompeii, with Vesuvius and forum participants in the backgroud.