but someone else, without any further characterisation of that someone. Perhaps it is the "world itself", as Vörösmarty once put it in his poem *Az emberek* [People]: "Hallgassatok, ne szóljon a dal, / Most a világ beszél": 'shut up, let no song be heard, now the world is speaking'. Brett Bourbon is right: fiction speaks like an oracle, not like an author.

Bourbon's theory seems to be, at a first glance. a contribution to what we started with: the philosophy **of** literature – after all, debates about the 'status' of fiction typically fall within the domain of literary theory. This is true, yet the quotational theory is much more than that. To understand where and why it is more, we must recall that discussions of fiction, as we saw, usually start with the 'comparison' of our ordinary world with the world of fiction. Then either a referential theory of language is utilised: 'how can ordinary words name entities in the possible world of fiction?'. Or a creational theory of language is used in which language, without our intentions, lets truth happen, and hence creates entities itself, or creation is claimed to be precisely relative to our intentional stances, as in speech-act theory. In the quotational theory, there is an interest in our stance, in our perspective, in our position, yet the quotational theory does not reduce this stance to our intentions but it is interested in our *understanding ourselves*: the quotational theory asks *how we understand ourselves relative to the words of fiction*. And doing this, it realises that the 'status' of fiction is not relative to reality, our world, but it is relative to us, to ourselves, but not to our intentions, but to *as we stand* and *how we are* with our understanding of ourselves. This way fiction, no longer bound by comparisons with the real world, is discovered as having a *new ontological status*, but 'new' not in the sense that it has been created by us: it is rather seen as a space where we may ask again *how* and *what* we are. By erasing the speaking subject with an intention from behind fiction, the quotational theory creates the possibility to seek a new ontological status for ourselves. Thus, through the reconsideration of one of the chief categories of literature, i.e. fiction, a new ontological space has been discovered, which can truly be taken as a contribution to philosophy. And concentration on our stance relative to fiction, and thus creating a new 'persona' behind fiction, who is not the 'I' as the speaker, also indicates that one of the most fruitful investigations in philosophy and literature might be expected in the direction of understanding in *how many ways we may be*: most probably first the 'I-you-he/she/it' relations, the ancient grid put on 'possible personae' and expressible through these grammatical personal pronouns, will have to be reconsidered.

Comparative volcano geomorphological studies

in the San Francisco, Springerville, Hopi Buttes and Mount Taylor volcanic fields

Dávid Karátson

Eötvös Loránd University
Dept. Physical Geography
H-1117 Budapest, Pázmány s. 1/c
http://geogr.elte.hu/
dkarat@ludens.elte.hu

Northern Arizona University
Geology Dept., Northern Arizona Univ.
PO Box 4099 Flagstaff, AZ 86011, USA
http://www4.nau.edu/geology/
Adviser: Michael Ort

During my Fulbright research period I was affiliated at Northern Arizona University in Flagstaff, to study old, eroded volcanic landforms of Arizona and New Mexico. In addition to these states, I visited six more ones ("volcanic states" such as Oregon, California, Washington, and "canyon states" of Colorado, Utah and Nevada). Most of the states were visited by professional field trips. In addition, mostly with my family I visited a number of national parks and monuments. During my Fulbright period, I attended two conferences (n international volcanological congress in Chile, and a Fulbright meeting in Washington DC), and gave three invited talks at various universities (NAU, UNM, and ASU) in Arizona and New Mexico under the Occasional Lecturer Program. Although due to the severe winter my field work was limited, I could go ahead with writing scientific papers, and eventually I completed or prepared four publications. Scientific work related to the Fulbright, among others a high-precision radiometric dating project supported by the Hungarian Fulbright Commission, is in progress. During most of my Fulbright period my family stayed with me; in particular, my children obtained significant experience in going to American elementary school and learning English.

1. Scientific purposes, activity and results

1. 1. Scope and goals of my Fulbright Research Grant in Arizona

In my Fulbright research period I planned to study selected volcanic fields in Arizona and New Mexico. The regional tectonic framework of my major research area, the Carpathian mountains (subduction-related volcanic arc and extension-related back-arc basin) provides many types of volcanic edifices to investigate. However, the prevailing temperate continental climate means that volcano degradation is constrained by moderate-high rainfall and dense vegetation conditions. In the volcanic fields of the Southwestern USA, volcano types occur that are similar to those in the Carpathians: e.g. stratovolcanoes and pyroclastic cones, and many of them are similar in age to the Carpathians. Also, volcanoes of Arizona and New Mexico mostly evolved under a semiarid climate, including minor glaciation at highest places during the last Ice Ages (Fig. 1). This may have resulted in different erosion rates and erosion patterns. The similarities and differences (1) may make the comparative approach very useful; and (2) case studies in the selected volcanic fields can contribute to better understanding of individual volcanic edifice history. I expected from my Fulbright period that joint research with my hosts and other cooperating scientists

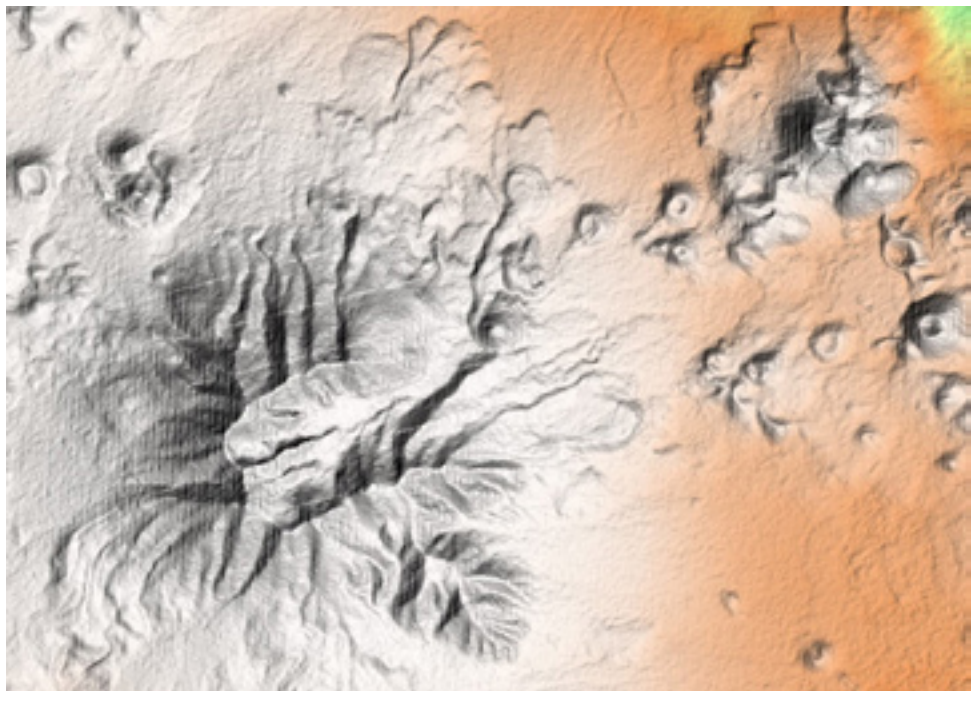

Fig. 1: Central part of the San Francisco Volcanic Field, wih the most prominent stratrocone San Francisco Mountain in the middle. Its central, elongated depression open to the northeast is attributed to sector collapse(s), subsequently enlarged by glacial erosion. Note the SW-NE alignment of the depression and also some parasitic vents to the east!

will result in important contributions to the above questions. Moreover, I anticipated that the obtained experience can be incorporated into my physical geography and volcanology courses after returning home. At my university, Hungary, I have two subjects (endogenic-exogenic forces of Earth, and volcanology special course) that have been newly introduced with the credit system. I expected that these subjects should be strenghtened by studies done under different climates. In addition to these scientific expectations, I planned to give presentations at several Southwestern US institutions, mostly universities, on my Hungarian research work. I assumed that my Carpathian case studies on volcano evolution under humid climates and having not only continental, subaerial, but also shallow-water submarine to emergent paleogeography can be interesting for the local scientific community.

Apart from all these professional objectives, I arranged my Fulbright to be spent mostly together with my family (wife and two sons). Not to mention a minor English of my wife, none of them had language skills and, more importantly, none of us had experience in living abroad for a longer time. Therefore, the planned Fulbright period was a big "undertaking" for all of us.

1. 2. Scientific activity

The 9 months I spent in the USA was unquestionably "quintessential", full of events, changes, journeys and useful work. My base was Flagstaff, at Northern Arizona University (NAU: Fig. 2), where I was introduced to the Geology Department by my host, associate professor Michael Ort. I got considerable help both from him and from Larry Middleton, head of the department. Most importantly, I had a

Fig. 2: My work place, the buildings of Geology Department of Northern Arizona University, Flagstaff, Arizona

separate workroom with internet access, it was actually a lab, but I was not disturbed at all for most of the time.

I did not know Michael earlier, but we knew from previous e-mail contact that our interests overlap. Unfortunately, Michael's timetable was very busy in 2004/2005, and it turned out that his current projects were not related to my main interest, which was the closest volcano to Flagstaff: San Francisco Mountain. However, he introduced me to his colleagues who already worked in that area. In particular, with retired associate professor Richard Holm I built up a very good personal and professional relationship. Also, I got considerable input from discussions and conversations with Drs. Wendell Duffield and Nancy Riggs. I joined some volcanological field trips in the vicinity organized by them, and those were quite useful in getting acquainted with the San Francisco Volcanic Field (Fig. 3).

As it turned out during my staying in Flagstaff, the most important factor I did not and could not calculate with in advance, was wheather. Unfortunately, winter came earlier than normal and it was extremely wet. I was told we had a winter which happens once in ten years. Due to the high elevation of Flagstaff and my target volcano, San Francisco Mountain (which is the highest point in Arizona, over 3,800 m), the precipication was mostly snow, and actually from November 2004 till late May 2005 the volcanic mountain was covered by thick snow, making it impossible to work or even to hike in high altitudes. Fortunately, during October I could take some field trips in and around the volcano, partly with Richard Holm, from which I greatly benefitted.

In addition to these early fall trips, in October I also visited another one of my target volcanoes, Mt. Taylor in New Mexico. That volcano was planned to be studied in cooperation with Dr. Larry Crumpler, research curator in volcanology and space sciences at New Mexico Museum of Natural History and Science. Taking field trips to that volcano was greatly helped by Larry, whose interest and concept of the volcano was the same as mine. Thanks to the smaller elevation (3,500 m) of Mt. Taylor, I could work there for some days in May 2005, too (Fig. 4).

Due to the severe winter, I could not access to the remote area of Springerville Volcanic Field at all, the third target volcano in my research plan, and for the same and other reasons, I could not visit Hopi Butte Field either, except for one tourist trip in Spring 2006. Consequently, most of the winter months had to be spent indoor. In my project proposal, however, I also aimed at computer work on the target volcanoes, using DEM (digital elevation model). With the help of the local USGS office in Flagstaff, I obtained detailed DEMs on my study areas, and started to work with them. In addition, I continued some of my Hungarian research (i.e., writing papers).

In addition to these activities, I attended two conferences and gave four talks during my Fulbright. The first conference was the International Congress of the IAVCEI (International Association of Volcanology and Chemistry of the Earth's Interior), held in Pucón, Chile, in early November. In addition to the meeting itself, I participated at a pre-congress field trip (A1) studying Parinacota and Taapaca, these being among Chile's most exciting and interesting active volcanoes (Fig. 5). All in all I spent almost three weeks in Chile and obtained much volcanological experience

and built up very important personal relationships. The other conference was an international Fulbright meeting held in Washington DC in April 2005. There, I met more than 50 Fulbright grantees from all over the world (none of them from Hungary!), and in addition to changing ideas and experience throughout the USA, we listened to interesting lectures on society, higher education, political issues etc, of the USA. From Fall 2004 to Spring 2005, I participated in the Occasional Lecturer Program, and gave three invited talks at three universities, organized or initiated by Michael Ort, Larry Crumpler and myself. In these lectures (21 October 2004, University of New Mexico, 31 January 2005, Arizona State University, and 22 March 2005, Northern Arizona University), the topics were erosion of volcanoes, their contrasting pathways, structural and climatic control, and volcanism of the Carpatho-Pannonian Region, its time-space activity, various trends, volcano types, growth and destruction. These talks attracted a number of colleagues and students, and I learned much from the related discussions. Finally, I gave a fourth talk at NAU, in the framework of a regular class, about the volcanism of Etna.

A volcanological field trip to the High Cascades, planned well before my Fulbright, became also very successful (Fig. 6). The trip, including famous and well-known volcanoes such as Mt. St. Helens, Crater Lake, Newberry Caldera, Mt. Hood, Mt. Shasta, etc., was organized by myself, with the help of distinguished volcanologists Drs. Jon Major and Willie Scott at Cascade Volcanological Observatory, and retired professor Nicholas Bariss (Univ.

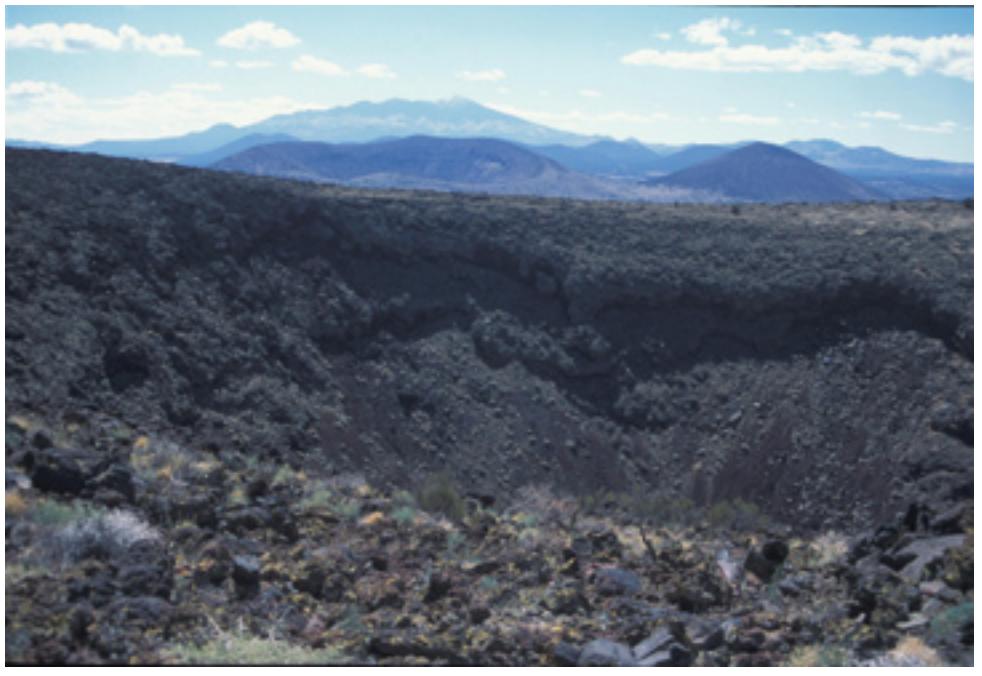

Fig. 3: Panoramic view of the northern cones of San Francisco Volcanic Field, with the intact SP Crater in the foreground and the Late Pleistocene, eroded San Francisco stratocone, highest point of Arizona (3,853 m), in the background

of Omaha, Nebraska). The field trip was arranged in late May (as late as possible with regard to my Fulbright period), in order to avoid wheather problems.

1. 3. Results and further plans

San Francisco Mountain is the major volcano of a polygenetic field comprising a large, silicic stratocone and a number of lava domes and cinder cones. Similarly to other large fields in and around the Colorado Plateau, these could form along faults in response to the thinning and young uplift of the plateau (Wood & Baldridge, 1990, Parsons & McCarthy, 1995). The Late Pleistocene San Francisco Mountain stratocone is characterized by a prominent outlet valley, which is wide and flat enough that one can exclude a fluvial origin. Although some authors stated previously that the valley may have been formed by an explosive sector collapse that truncated the cone (e.g. Wolfe 1990), details of this collapse as well as further valley evolution of the cone flanks are not known. In a recent paper, Richard Holm (2004) published an analysis of boreholes, in which he revealed old volcaniclastic successions, among others gravitational sector collapses. A major problem is that in the field, debris avalanche deposits of neither explosive nor gravitational origin can be found. In a joint field trip with Dr. Holm, we discussed that effusion of the final-stage low-viscosity andesite lava flows could not be associated with explosive collapse(s), whilst, on the other hand, deposits of gravitational collapses (if occurred) could be covered by subsequent

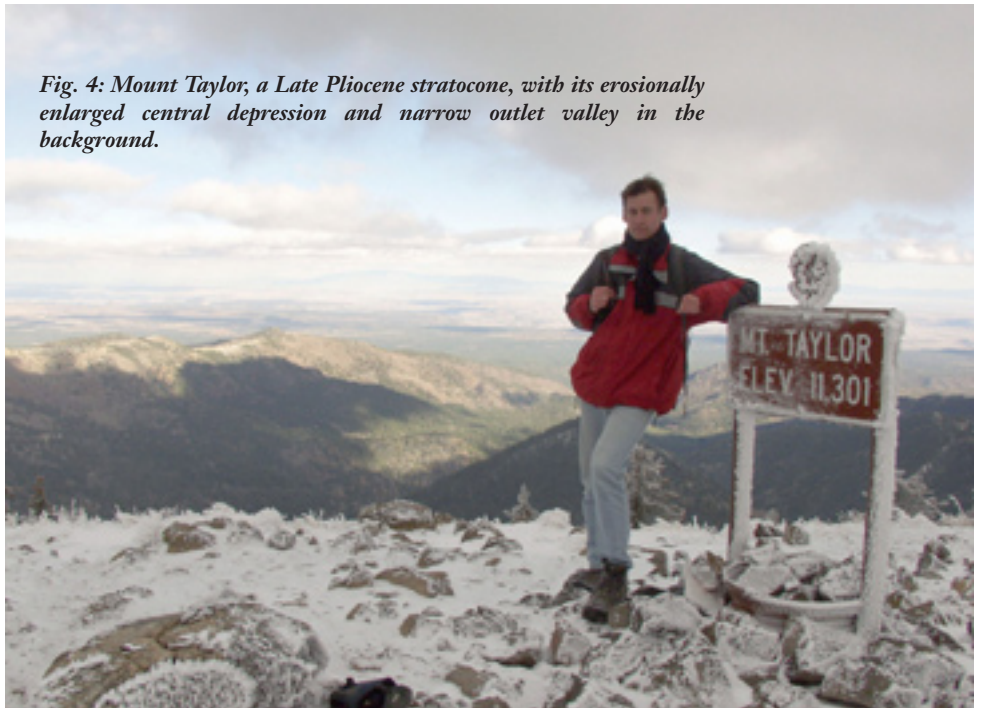

Fig. 4: Mount Taylor, a Late Pliocene stratocone, with its erosionally enlarged central depression and narrow outlet valley in the background.

products. Alternatively, or in addition, some authors proposed that glaciation contributed to valley enlargement, but there is only little evidence of glacial moraines in the field. All in all, after clarifying the possible role of the mentioned volcanic and exogenic (erosional) processes, in my studies I started to focus on the ancient, or if a collapse occurred, pre-collapse volcanic morphology, namely, how many centres/cones in what configuration may have existed.

With one of the best preserved caldera-like depressions in the region, the Pliocene – Early Pleistocene (3.5-1.5 Ma) Mount Taylor is a typical continental stratocone (Crumpler 1982, Perry et al. 1990). Apart from approximately 250 vents (cinder cones, maars, domes) of the Mesa Chivato (extending northeastward from Mount Taylor), surface evolution of the stratovolcano is perhaps of greatest interest from the geomorphic point of view (Fig. 7). As for its almost closed central depression, glacier erosion, unlike at San Francisco Mt., has not been documented, whereas the fluvial origin of the present-day outlet valley is obvious. Especially early in its history, fluvial erosion and downcut was significant (Love and Connell 2005). L. Crumpler (1990, and personal communication) first invoked Mt. St. Helens-type sector collapse and later an erosional widening by removal of loose pyroclastics from the interior over subsequent geologic time. G. A. Smith (personal communication) cannot find evidence for a sector collapse, making the erosional hypothesis more likely. A detailed geomorphological study to refine these concepts has not been carried out. With the help of a high-resolution DEM,

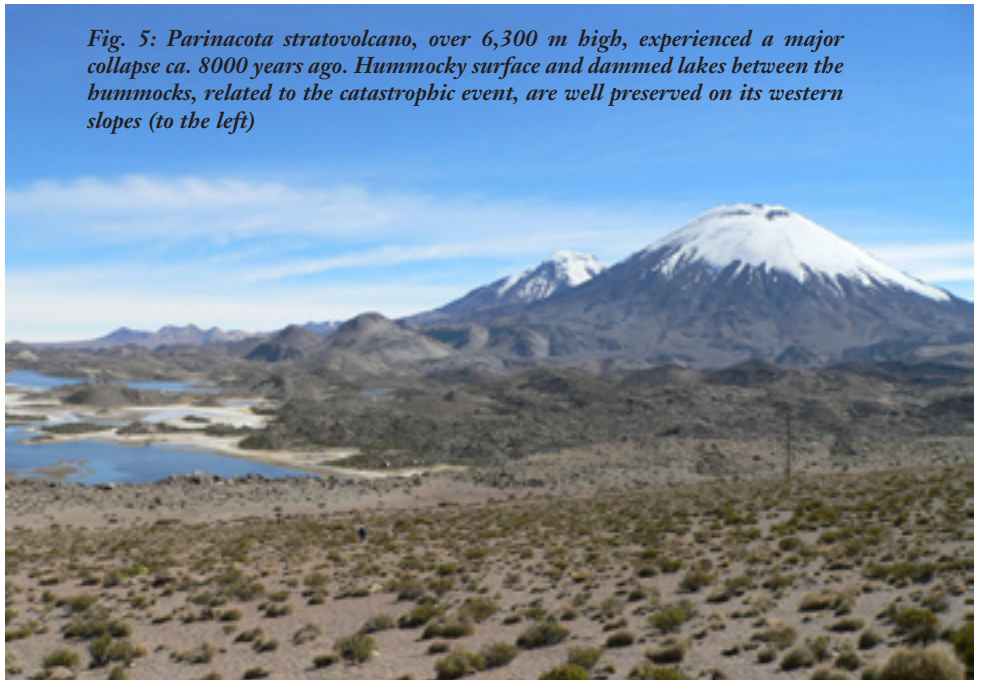

Fig. 5: Parinacota stratovolcano, over 6,300 m high, experienced a major collapse ca. 8000 years ago. Hummocky surface and dammed lakes between the hummocks, related to the catastrophic event, are well preserved on its western slopes (to the left)

I also started to carry out a detailed analysis about the volcano's original cone configuration.

To summarize the previously known and during my Fulbright the field-checked information, similar features of the eruptive activity of the two volcanoes are (1) summit structures of stratified andesitic or trachyandesitic lava flows and breccias, (2) subordinate pyroclastic deposits in the cone-building successions, (3) presence of more viscous dacitic parasitic domes, (4) concave-up "stratovolcano" slopes, with enlarged central depressions, and (5) well-developed volcaniclastic aprons.

Differences between the two volcanoes are the ages of volcanic activity and geomorphic details of the central depressions. Eruptions at Mount Taylor occurred between 3.9 and 1.7 Ma (Lipman, P. W. and Mehnert, H. H. 1979); the stratovolcanic activity possibly constrained to 3.0-2.5 Ma, but relatively little known about the entire volcanic stratigraphy. San Francisco Mountain erupted between 2.8 and 0.22 Ma (Damon et al. 1974), with the principal cone constructed 0.92-0.43 Ma. That is, while the former volcano is Late Pliocene age, the latter is late Pleistocene. San Francisco Mt. is about 400 m higher and much better preserved than Mt. Taylor. The central depression of San Francisco Mt. is more open relative to that of Mt. Taylor, the latter having a bottleneck morphology at the outlet. Sector collapses were put forward for both volcanoes, although the highly dissected interior of Mt. Taylor in addition to the narrow outlet argues for that fluvial erosion was

Fig. 6: Mt. Shasta, 4317 m high, is a dormant compound stratovolcano composed of overlapping cones, mostly lava domes, centered at four or more main vents

significant in excavating, or even creating, its depression. At both volcano, due perhaps to the final-stage cover deposits and to substantial erosion, it is difficult to identify and document collapse materials separately from the common, smaller-scale debris flow deposits. These latter deposits were field-checked by our field trips.

Preliminary results of DEM analysis of San Francisco Mountain can be summarized as follows: the original volcano may have been a complex edifice with a number of vents and possibly lava domes, instead of a simple "stratovolcanic" cone. Contrasting aspects of the slopes as well as directions of ridges point to several (at least three) centres (Fig. 8). Since there is no geologic record of an explosive (final) stage, or hydrothermal activity resulting in edifice weakening, the only cause of a gravitational cone collapse might be tectonic activity. The NE-SW alignment of post-stratovolcanic cones is in accordance with the NE-SW-elongated caldera shape. Glacial modification of the truncated cone is obvious, whereas fluvial erosion, given the lack of fixed water courses and downcut in the interior, should have been insignificant.

Based on a newly built acquaintance with associate professor Brad Singer, I initiated a dating project with the University of Wisconsin in Madigan. After returning Hungary I could find financial support by the Hungarian Fulbright Commission, and started to work with Richard Holm on a high-precision (Ar/Ar) radiometric

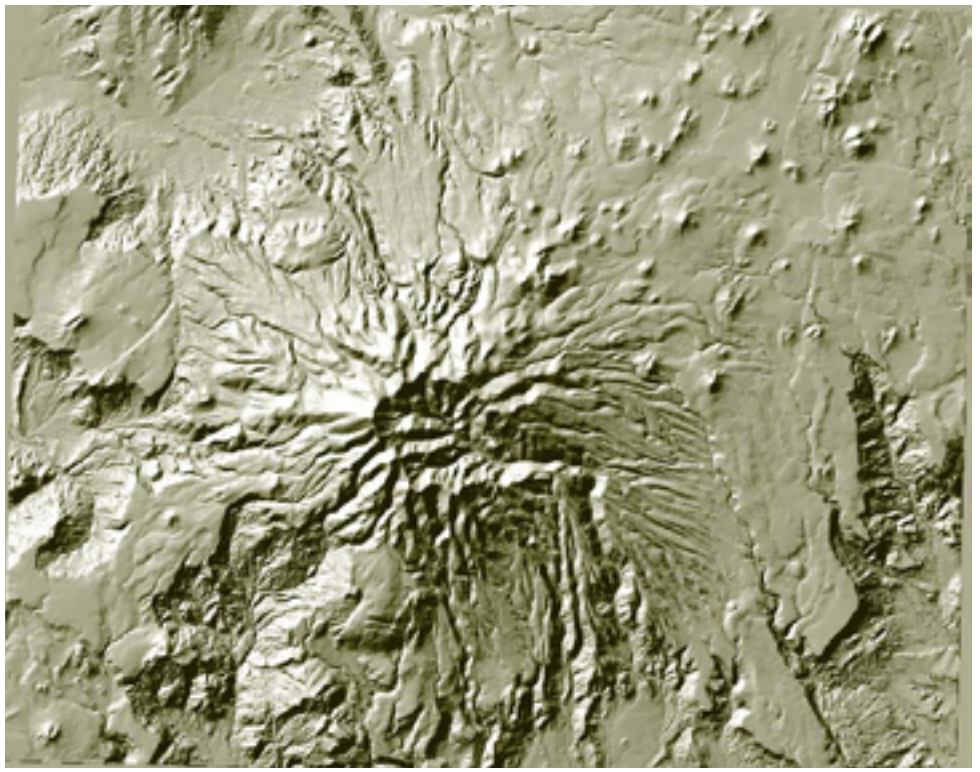

Fig. 7: Shaded relief image based on the high-resolution digital elevation model (DEM) of Mt. Taylor. The stratovolcano is located in the southwestern part of Mesa Chivato, comprising small parasitic vents (well visible to the northwest)

dating project of the final activity of San Francisco Mountain. Our goal is to reconstruct the volcano-geomorphic configuration of the latest cone-building eruptions, prior to development of the central depression. We would like to determine the shape and distrubution of late-stage summit vents and craters in order to conclude the final morphology prior to volcano degradation. As referred to in the above, the available K-Ar dates were measured in the 1970s, and no Ar/Ar ages are available.

2. Life in the USA

2. 1. Settling down and managing ourselves in Flagstaff, Arizona

In order to prepare our settling down, I arrived some weeks earlier than my family to resolve administrative issues. Although, as I mentioned above, my host gave me a considerable help and also there was a Fulbright coordinator at NAU, each task required for a normal family life (housing, schooling, bank account, driving license etc.) should have been managed separately, taking much time. Obviously, some specific problems were due to the relatively small size of Flagstaff. However,

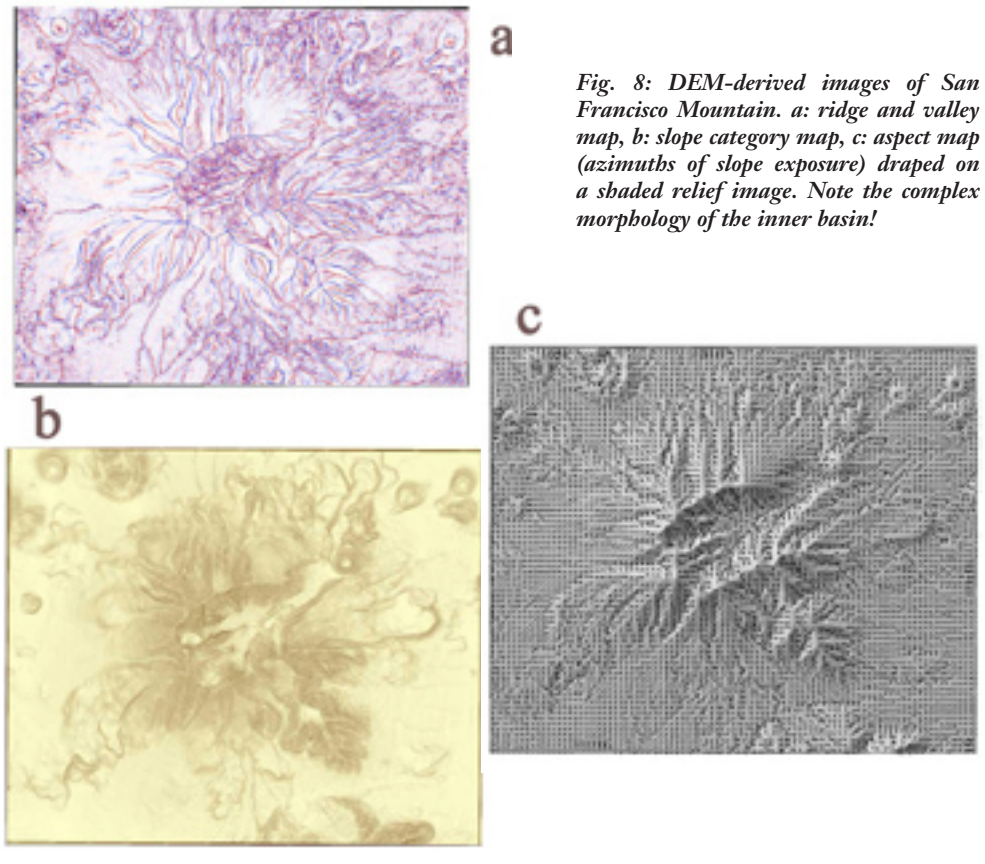

Fig. 8: DEM-derived images of San Francisco Mountain. a: ridge and valley map, b: slope category map, c: aspect map (azimuths of slope exposure) draped on a shaded relief image. Note the complex morphology of the inner basin!

these could be resolved eventually, and no serious conflicts arose.

While bureaucracy could not be avoided, I wish to report that in schooling as well as health care we experienced remarkable help as well as moral support. In particular, in the school which was the only appropriate choice for foreign children in Flagstaff, i.e. South Beaver School (named for the street it is located, near NAU campus), both the director and the teacher staff showed the maximum treatment and empathy toward our sons. It was not easy at all at the beginning to start their work in the classes. With no English, only the younger one (2rd class) could find suitable occupation; the elder one (4th class), with more skillfullness required, was faced by serious problems in understanding the tasks. However, thanks to the teachers, these problems were overcome gradually. In math and computer work, as well as doing sport (especially soccer [European football] and basketball), they both were among the best, and this had a serious push on their further learning. Although they still had emotional problems for many weeks, after progressive improvement in understanding, at the end of the third months they started to speak (Fig. 9). Their pronounciation has been excellent and we strongly hope that the basic English will be enough for the future, when getting a more developed language skill. Also, as for health care, we experienced great respect and treatment in smaller to bigger issues. To mention one example, it occurred twice that our kids were treated with urgency care, regardless of what health insurance we had.

Due to the preferred location of Flagstaff (i.e. near the Grand Canyon) and probably due to its small size, housing rates are relatively high, and it would have been difficult to find an appropriate solution. Fortunately, with the help of the university administration, we could find relatively good apartments on campus, with the only problem that we had to move from one place to another in the middle of winter, because of apartment rebuilding.

2. 2. Travelling in the USA

During the time my family stayed with me, mostly we visited the vicinity of Flagstaff, as well as some neighbouring spectacles, especially national parks and monuments. As we learned well in advance, we had to purchase a car, and it was worthy. We bought the one-year valid Eagle family card for National Parks, and using that card we visited famous canyonlands such as Grand Canyon, Bryce and Zion canyons, small but similarly spectacular canyons, e.g., Antelope and Walnut canyons, and other geologic and historic places of interest such as Petrified Forest, Sedona Red Rock Country, and Montezuma Castle (Fig. 10). Also, we visited big towns such as Phoenix and Las Vegas. Unfortunately, together we did not have time and opportunity to visit farther away, so the basic impression my family obtained was about the canyonlands of the Southwest USA. As for myself, partly connected to the previously mentioned professional trips, I was able to visit much more places of interest in a number of other states. Altogether I visited eight states (Arizona, New Mexico, Oregon, California, Washington, Colorado, Utah, Nevada); in addition to Phoenix and Las Vegas, two other big towns (Denver and San Francisco), and during my Fulbright meeting two metropolises (Washington DC and New York). Eventually I was in 11 National Parks (Grand, Bryce, Zion, Antelope and Walnut canyons,

Fig. 9: In the primary schol playground: our younger son (in the back) together with its 2nd class schoolmates

Perified Forest, Monument Valley, Mesa Verde, Sequioa, Yosemite and Crater Lake National Parks), and a number of national monuments. I flew more than 46 000 km (from and back to Europe, to and back from Chile, and domestic flights during the Fulbright meeting), drove at least 13 500 km (the two longest trips being the High Cascades up to Washington, and Colorado up to Boulder-Denver) and took 2500 km by bus (Greyhound).

Driving in the USA was very easy, but ironically too easy

Fig. 10: One of the little known but highly spectacular canyons: the "Red Rock Country" near Sedona. Our two kids in the foreground.

for a European. I had serious problem not with the physical demand, but with time. Especially toward the end of my staying in the USA, in order to drive extremely long distances in 12 to 14 hours totally alone, I needed an extreme concentration and self-discipline to moderate loneliness. The final, most spectacular and professionally most useful journey to the High Cascades (10 days) needed a very careful planning to maintain myself in the best state, in order to see and learn as much as possible. Hereby I wish to thank again the CVO colleagues Jon Major and Willie Scott for their generous help, and especially Nicholas Bariss for his ideas, help and kind hospitality, lending his summer house to me in Eugene, Oregon.

2. 2. Personal relationships and experience

Two "levels" of American behavior was experienced by us, which had not been obvious and known for us earlier. The first level was the "professional" one, i.e. a great empathy and treatment of any kind of employees toward the foreigners. As I reported in the above, behavior of particularly the health care staff and the teachers in the primary school should be appreciated here. We experienced the same attitude in shops, pharmacies, national park service, fuel stations etc.

The other "level" which cannot be distinguished in Hungary and most European countries is the more personal sphere, i.e. the possibility to get acquainted with somebody, a guest from far abroad, especially with whom one spends a longer time jointly. In this respect we were not too successful, and the average experience was not the one we expected. Partly probably

Fig. 11: A party organized on my birthday: conversation about recent politics with a good friend of us.

due to language problems, largely we could not build up close relationships to colleagues, co-parents, families etc. Personal or family invitation, and shared activities were relatively rare, and for us it turned out eventually that the personal "isolation" is quite normal at least in the Southwest USA, unless somebody belongs to special circles, groups, organizations of the society. As we understood – also from conversations with some "exceptional" colleagues and friends who confirmed our evaluation – all this peculiarity is related to the interpretation of freedom, i.e. nobody wants to interact with other people if it may be evaluated as disturbance. This attitude can be very useful for many, but especially during the long winter months indoor, when we suffered from home-sickness many times, this was not too helpful for us.

Of course, as indicated in the above, there were many exceptions, and very likely if we had selected another place, probably in the east or west coast with a longer-lasting culture and variegated tradition, we would have got different experience. For example, we visited many times Phoenix, where we found other Hungarians, and they introduced us to local friends with whom we spent pleasant days. I should mention here Richard Holm again, who and whose wife were very kind to me, and who showed a real interest toward Hungary. Also, hereby I would like to thank Maria and Ben, our good friends in Flagstaff, for their kind help with me and my family (Fig. 11).

The Fulbright conference held in April 2005 was a very nice journey for me, and I enjoyed it to a great extent. The Fulbright staff was very nice and kind, the organization was excellent, and I wish to express my thanks again for the opportunity of participating.

To sum up, the 9 months spent in the USA was an unforgettable period for all of us. I benefitted a lot from the professional point of view, both in terms of volcanology and my university subjects. I took some 4000 slides, and after returing to Hungary I already gave 5 talks, among them professional reports, about my experience in America. Last but not at least, I would like to thank again the Fulbright Commission for the opportunity in participating in the Fulbright program.

Bibliography

Crumpler, L.S., 1982: Volcanism in the Mount Taylor region: New Mexico Geological Society Guidebook 33, p. 291-298.

Damon, P. E., Shafiqullah, M., Leventhal, J. S., 1974: K-Ar chronology for the San Francisco volcanic field and rate of erosion of the Little Colorado River. In: Karlstrom, T. N. V., Swann, G. A., Eastwood, R. L. (eds.), Geology of northern Arizona, Part I – Regional Studies. Geol. Soc. Am., Rocky Mountain Section Meeting, Flagstaff, Arizona, Guidebook, p. 221-235.

Lipman, P.W. And Mehnert, H.H., 1979, Potassium-argon ages from the Mount Taylor Volcanic Field, New Mexico: U.S. Geological Survey Professional Paper 1124-B, 8 pp.

Holm, R. F., 2004: Landslide Preconditions and Collapse of the San Francisco Mountain Composite Volcano, Arizona, into Cold Debris Avalanches in Late Pleistocene. The Journal of Geology, 112, No. 3, p. 335-348

Love, D.W. and Connell, S.D., 2005: Late Neogene drainage development on the southeastern Colorado Plateau, New Mexico: New Mexico Museum of Natural History and Science Bulletin 28, p. 151-169.

Parsons, T., McCarthy, J. 1995: The active southwest margin of the Colorado Plateau: Uplift of mantle origin. Geol. Soc. Amer. Bull., 107 (2), 139-147.

Perry, F.V., Baldridge, W.S., DePaolo, J., Shafiqullah, M., 1990: Evolution of a magmatic system during continental extension: the Mount Taylor volcanic field, New Mexico: Journal of Geophysical Research, v. 95, p. 19327-19348.

Wolfe, E. W., 1990: San Francisco volcanic field, Arizona. In: Volcanoes of North America (eds: Wood, C.A., Kienle, J.), Cambridge University Press, 278-280.

Wood, C.A., Baldridge, S. 1990: Volcano tectonics of the Western United States. In: Volcanoes of North America (eds: Wood, C.A., Kienle, J.), Cambridge University Press, 147-154.