PRESIDENT'S MESSAGE

It is said that "Every scientist rises from the shoulders of those who went before" and it is a great honour and pleasure to be assuming the presidency of the AEG following so many illustrious predecessors and also to have the opportunity to work alongside many world class geochemists who have put a lifetime of experience and effort into the success of the Association of Exploration Geochemists (AEG). David Garnett, my immediate predecessor in particular deserves all our thanks for the outstanding contribution he made to AEG as President during a very busy year which included the excellent 18th International Geochemical Exploration Symposium (IGES) meeting in Jerusalem and the highly successful 4th International Symposium on Environmental Geochemistry (ISEG) meeting in Vail, while at the same time continuing to manage his company, Becquerel Laboratories. He has, in particular, focussed our attention on the negotiations concerning the future of the Journal of Geochemical Exploration (JGE), which is one of the most important decisions to be made by the AEG this year. I look forward to benefiting from his advice on this and other matters as he continues to serve on Council.

Perhaps the most important milestone in the history and joint development of the AEG and JGE, however, has just been been too quietly passed over with the retirement from active duty of the JGE's founding Editor-in-Chief, Eion Cameron. His lifetime contribution to the JGE including the promotion of JGE Special Issues, over more than a quarter of a century, has been one of the keystones to and vital ingredients of the success and development of exploration geochemistry worldwide.

Thanks are due to Sherman Marsh as Secretary of AEG and both he and Tom Nash for editing EXPLORE and especially for pioneering the use of colour publishing wherever possible. Gwendy Hall our Treasurer, expertly advised by Eion Cameron, and Betty Arsenault our Business Manager, have jointly reorganised the office of the AEG into an efficient and professional business. Thanks are also due to our retiring Councillors most of whom will continue to serve the AEG in other important roles. The network of Regional Councillors helps to ensure AEG representation in strategic regions of the world, and this network provides a vital link with the membership in the development and promotion of AEG-sponsored activities.

The active membership (voting fellows and non-voting members) has held fairly constant in recent years at about 1,150, up somewhat from 985 in 1993. Membership is predominantly based in North America with 595 members, however other regions are well represented with Australia 250, Europe 121 Asia 110, South America 97 and Africa 38 members. The AEG attracts substantial numbers of new members who recognize the

PAST-PRESIDENT'S MESSAGE

Are we witnessing the end of the gold exploration boom? Busang and a drop in the gold price have combined to send a shudder through the market and the prophets of doom and gloom have emerged from their long hibernation. Mines are closing, funding for new ventures is harder to find than it was a year ago, and both mineral exploration groups and laboratories are shedding staff. My guess is that this is no more than a temporary setback but it does give many of us the chance to draw breath and perhaps look around at the challenges involved in exploring for commodities other than gold. We have to look back a long way to remind ourselves that there were base metal and uranium exploration booms before gold came to dominate many exploration budgets, and it is sobering to reflect on the fact that a significant number of our members will have spent their entire professional careers looking solely for the yellow metal.

Change is inevitable and while it can be disruptive in the short term it can also open up new opportunities and interests. It may also offer greater freedom to do no more than stop and think, and perhaps to write up some of the results that have accumulated over the last few years. For those of you who find yourselves in that position, please remember that we are always looking for papers for the Journal of Geochemical Exploration (or its successor), and for EXPLORE. The 19th IGES will be held in Vancouver in 1999 and we would like to make it the biggest and best yet, so start planning to be there, preferably with a paper to tell us what you have been doing.

Change is also inevitable in the Presidency of the AEG, which now passes into the extremely capable hands of Peter Simpson. I look forward to continuing to serve on Council as we confront the challenges that lie ahead. The most immediate of these involves a decision on the future of the Journal of Geochemical Exploration.

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Information for Contributors to EXPLORE

Scope: This Newsletter endeavors to become a forum for recent advances in exploration geochemistry and a key informational source. In addition to contributions on exploration geochemistry, we encourage material on multidisciplinary applications, environmental geochemistry, and analytical technology. Of particular interest are extended abstracts on new concepts for guides to ore, model improvements, exploration tools, unconventional case histories, and descriptions of recently discovered or developed deposits.

Format: Manuscripts should be double-spaced and include camera-ready illustrations where possible. Meeting reports may have photographs, for example. Text is preferred on paper and 5- or 3-inch IBM-compatible computer diskettes with ASCII (DOS) format that can go directly to typesetting. Please use the metric system in technical material.

Length: Extended abstracts may be up to approximately 1000 words or two newsletter pages including figures and tables.

Quality: Submittals are copy-edited as necessary without re-examination by authors, who are asked to assure smooth writing style and accuracy of statement by thorough peer review. Contributions may be edited for clarity or space.

All contributions should be submitted to:
EXPLORE
J.T. Nash, Box 25046, MS 973, Denver Federal Center
Denver, CO 80225, USA

Information for Advertisers

EXPLORE is the newsletter of the Association of Exploration Geochemists (AEG). Distribution is quarterly to the membership consisting of 1200 geologists, geophysicists, and geochemists. Additionally, 100 copies are sent to geoscience libraries. Complimentary copies are often mailed to selected addresses from the rosters of other geoscience organizations, and additional copies are distributed at key geoscience symposia. Approximately 20% of each issue is sent overseas.

EXPLORE is the most widely read newsletter in the world pertaining to exploration geochemistry. Geochemical laboratories, drilling, survey and sample collection, specialty geochemical services, consultants, environmental, field supply, and computer and geoscience data services, are just a few of the areas available for advertisers. International as well as North American vendors will find markets through EXPLORE.

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Geochemical Exploration. I would like to acknowledge all who responded to my last President's message on this topic, as indeed I thank all who have sent me comments throughout the year on a variety of topics. I would also like to thank all members of Council, Regional Councillors and our various committees for their input throughout the year, and express particular thanks to Gweny Hall, Sherman Marsh, Tom Nash and Betty Arseneault for the major contribution that they have made. Charles Butt and Ray Smith have been outstanding as our Distinguished Lecturers and have put enormous amounts of time and effort into delivering lectures on every continent, with the possible exception of Antarctica. We thank them both.

As I step down after a single year I am accompanied by Eion Cameron who has occupied the position of Editor-in-Chief of The Journal of Geochemical Exploration since its inception in 1972. I suspect he may have been a marathon runner in his youth for it must take someone with that mental strength to survive in such a demanding job for so long. What is even more impressive is that he has still retained his sense of humour. It is not unreasonable to claim that he has done more to promote the science of exploration geochemistry than any other geochemist and I know I speak on behalf of all members, past and present, when I express our deepest thanks to Eion for his commitment and his intellectual rigour over the years.

I have been fortunate to be President in a year that featured two outstanding meetings, with their associated field trips — in Jerusalem and Vail — and my thanks go to all who worked so hard to make these meetings such a success. It really has been a great privilege and pleasure to meet so many talented geochemists over the last year and it has certainly reinforced my belief that exploration geochemistry is in good health. My best wishes to Peter for the year ahead.

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President's Message
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many advantages and benefits of membership of a dynamic scientific and professional learned society become more widely appreciated. However, these gains tend to be offset by the loss, for various reasons, of members. The vital need for the highest technical and professional standards in geochemical exploration, especially in the light of recent events in the exploration industry (Busang), has never been greater than it is today. Fellowship of the AEG is therefore likely to become increasingly important where evidence of professional and technical competence and integrity in the practice of exploration geochemistry is required.

As the first President to be based in Europe, where 10% of the membership is presently located, this is both an opportunity and a challenge. European exploration geochemistry has a proud history with many world class geochemists such as, Fersman, Brundin, Rankama, Sahama, Webb and others. European exploration geochemists frequently work internationally on mineral exploration projects and have also played a major role in adapting methods designed initially for mineral exploration to a wide range of mainly environmental studies, often with spectacular results. Their professional experience can be very variable and reflects current economic priorities since exploration geochemistry has a high priority in Spain, France, Scandinavia (including Greenland) and eastern Europe generally, whereas in other countries such as the UK and Benelux countries, interest in environmental geochemistry presently predominates, as it is becoming increasingly useful and relevant to the well being of society.

The application of and need for these studies however is largely driven by new legislation, enacted nationally, but following on from the need to meet goals established by the European Environment Agency, which has resulted in an increase in the cross linking and exchanges between geochemists, industry, government and many other scientific disciplines. The main objective is to develop legislation and a practical methodology which will be effective in predicting and minimising the environmental harm due to pollution incidents arising primarily as a consequence of human activities. These can arise either by contamination of the environment or by the action of disturbing a pre-existing environment, or both, especially in areas characterised by high natural baseline levels for potentially harmful elements. Since both the methodology used and the media studied are often common to environmental and exploration geochemistry, this provides a wide and diverse opportunity for applying these skills. Hence geochemistry is becoming particularly attractive to younger scientists seeking career opportunities, but who may be concerned at entering a profession, which on the exploration side alone, may appear to be unduly at the mercy of the business cycle.

We are greatly indebted to Arthur Darnley for his help in adjusting to these new challenges. He had the foresight and persistence to start work over fifteen years ago in collaboration with other geochemists who were strategically located across the world, to establish the International Geological Correlation Programmes 259 (International Geochemical Mapping) and 360 (Global Geochemical Baselines). These projects have now completed their primary function of developing and establishing a suite of internationally agreed methods and standards since it is vital to ensure that baseline studies are founded on sound scientific principles. These are required; 1) to identify where mineral resources are located on the global scale, 2) for further resource assessment, 3) for the sustainable management of natural resources from both the scientific and legislative viewpoints, and, 4) for provision of geochemical baselines, which are required by both the public sector and private companies to deal with future environmental and legislative issues. The international work will be carried forward in the future through the establishment of an IUGS Working Group on Global Geochemical Baselines.

In Europe, these programmes have stimulated the organisation and establishment of metadatabases which describe existing geochemical datasets held in national archives, through the sponsorship of the Forum of the Directors of European Geological Surveys (FOREGS). It is equally important to follow this up and to ensure that the strategic significance of these databases as a source of geochemical standards and their natural variation, is recognised by the European Environment Agency, when developing legislation for the protection of the European environment. The European expectation of exploration geochemistry, which was designed primarily as a practical and effective tool for mineral exploration, is that it will emerge in the future, as a highly sensitive and sophisticated exploration method, which can be simultaneously used for measuring, minimising and ultimately controlling the impact of man in a developing world.

The AEG is an international association which has always encouraged international membership and has fostered the take up and dissemination of best practice in exploration geochemistry world wide. It is very encouraging to see the extent to which many countries, which are beyond the main centres of membership activity in North America and Australia, especially China, Brazil, Ecuador, Columbia, Argentina and the Caribbean region to name but a few, are now surging forward with the development of major new programmes of work, which are the key to wealth creation and the hope and means of a better and healthier lifestyle for many who have the greatest need.

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NOTES FROM THE EDITORS

Sherman Marsh and Tom Nash

This issue brings word of changes in the Association. The Presidency has moved to England for the first time, into the capable hands of Peter Simpson. A new group of Councilors was elected. Gwendy Hall steps out of one role on Council into new roles. Fortunately for AEG, rotation out of office does not mean the end of activity by David Garnett, Gwendy, Steve Cook, and Dick Glanzman. Communication among the past and present officers and councilors is very active and facilitated by frequent email messages.

Communication of technical materials for EXPLOR and other AEG needs have been expedited by Vivian Heggie. This month she rescued us several times with rapid international transfer of complex files. Final layout and production of EXPLOR has been handled by Vivian for many years, and we come to count on her magic in transforming bland drafts into the attractive newsletter that you read. And at times we become complacent, expecting Vivian and computers to be perfect. EXPLOR Number 97 contained many printing errors that were created by computer gremlins that failed to properly translate special Greek characters. The real error was by humans, of course, when the editorial group here in Denver failed to check the final proof carefully enough to catch the characters. Vivian, thanks for your many creative contributions to EXPLOR and AEG.

ERRATA AND APOLOGY

The Technical Note in EXPLOR 97, Scale effects in geochemical haloes of hydrothermal mineral deposits, by Sandomirsky and Karger was printed with numerous errors that were not created by the authors. Many Greek symbols in equations, text, and figure captions, were inadvertently confused when the document file was imported into the word processor used for final layout, and the errors were not caught by us in final proofs. Some of the Greek symbols were converted to Latin ones, and some were not converted at all and were printed as blank spaces. For example the function \( \gamma(h) \), for "semivariogram", is used many times and in the printed version appears as blank spaces.

In this era of electronic word processing we tend to become complacent, assuming that computers don't make mistakes. In the early stages of assembling and editing of EXPLOR, we utilize one brand of word processor that happened to reproduce the symbols in documents submitted by Sergey Sandomirsky; we even sent the documents back and forth several times by email with no problems on special characters. When the Technical Note seemed to be in good final form, we assumed the next stage of layout on another word processing system would reproduce the document faithfully. Not so. Also, the final checking of page proof, done while Sherm and I were on travel, was by two geochemists who did not have a copy of the original document, and they had no reason to believe that the proof needed to be checked letter by letter, symbol by symbol (which is very tedious work).

We apologize to the authors, Sergey Sandomirsky and Mir Karger, who worked diligently to provide us with material that was in very good English and free of technical errors. The errors were introduced by the Editorial Staff of EXPLOR here in Denver.

We hope that the technical information in the note is understandable, despite the printing errors. Anyone wishing to read a complete and correct version of the note can obtain a paper copy by mail, or a digital file by email, by contacting me at 303-236-5515, or email to tnash@usgs.gov.

Tom Nash  
Co-Editor.

AEG COUNCIL ELECTIONS

Votes cast by Association of Exploration Geochemists (AEG) Fellows in November and December for Councilors (1998-2000 term) were counted and declared final on January 5, 1998. A total of five Councilors were elected and David Garnett, our past President, was appointed to Council as ex officio. This gives us a full compliment of six Councilors for the term. Re-elected for a second term were M. Beth McClengahan and J. Thomas Nash. Three new Councilors were elected: Eric Hoffman, Ray Lett, and David B. Smith. Eric and Ray are long-time Fellows who have served on Council and the Executive before, whereas Dave Smith is serving for the first time. We welcome the new and returning Councilors and look forward to their input for the next two years.

The Association would like to thank two retiring Councilors, Dick Glanzman and Steve Cook, for their excellent service over the past two years. Many thanks to Dick and Steve for their comments and help. Gwendy Hall also deserves our thanks as she steps down from being ex officio Councilor. She will continue to serve in many ways, including roles as Treasurer and as co-editor of Journal of Geochemical Exploration.

Sherman Marsh  
Secretary, AEG

AEG CO-SPONSORS MEETING

Geology and Ore Deposits 2000: The Great Basin and Beyond will be co-sponsored by The Association of Exploration Geochemists. The meeting will be held in Reno/Sparks, Nevada, May 15-18, 2000, with field trips and special courses before and after the meeting. A short course on exploration geochemical methods is being organized by Clark Smith, and Clark is the AEG representative on the planning committee of the Geological Society of Nevada. Stay tuned for further announcements; will gold still be the major theme? Interested persons can contact Clark by email: sheaclarksmith@compuserve.com
Behavior of Gold Anomalies in Stream Sediments of Peloritani Mountains (Northeastern Sicily, Italy)

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3 - Istituto di Scienze della Terra, S.Agata - Papardo, 98166 Messina, Italy.

INTRODUCTION

This report concerns a geochemical stream sediment follow-up survey conducted along an “anomalous belt,” occurring in the Peloritani Mountains, northeastern Sicily. Anomalous Au values were found recently, mostly in the catchment basins of Fiumara Dinarini and Vallone Monastri by means of a follow-up survey (De Vivo et al., 1993), distributed in a belt along the thrust contact of two metamorphic Hercynian Units: the Aspromonte and Mela Units (mostly high-grade metamorphic rocks) and the Mandanici Unit (mostly low-grade metamorphic rocks). In addition to Au anomalies in stream sediments, Au flakes (between 100 and 400 µm in size) have been identified as well along this “auriferous belt”.

The present follow-up survey was conducted in the eastern tributaries of the Vallone Pularlo (draining Pizzo Ruggeri, Roccia di Vernava, Pizzo Cipolla, Pizzo Mualio mountains) and the catchment basin of Fiumara Dinarini (draining Pizzo Cipolla, Pizzo Cappara, Pizzo Cafi mountains), covering an area of 7 km² with a nominal sampling density of 14 samples per km². The aim of this survey was: a) to check the results reported in the previous detailed survey (De Vivo et al., 1993); b) to better identify the source areas of the anomalous samples; c) and, mostly, to determine which grain size fraction gives the best response for the presence of Au anomalies.

GEOLOGY

The Peloritani Mountains constitute the southernmost portion of the Calabria-Peloritani Arc (CPA), which is an arc-like structure connecting the NW-SE trending Italian Apennines with the E-W trending Sicilian and North Africa Maghrebids. The Arc consists of several Alpine thrust sheets, with the E-W trending Sicilian and North Africa like structure connecting the NW-SE trending Italian portion of the Calabria-Peloritani Arc (CPA), which is an arc-like structure connecting the NW-SE trending Italian Apennines with the E-W trending Sicilian and North Africa Maghrebids. The Arc consists of several Alpine thrust sheets, with the E-W trending Sicilian and North Africa like structure connecting the NW-SE trending Italian portion of the Calabria-Peloritani Arc (CPA), which is an arc-like structure connecting the NW-SE trending Italian Apennines with the E-W trending Sicilian and North Africa Maghrebids. The Arc consists of several Alpine thrust sheets, with the E-W trending Sicilian and North Africa like structure connecting the NW-SE trending Italian portion of the Calabria-Peloritani Arc (CPA), which is an arc-like structure connecting the NW-SE trending Italian Apennines with the E-W trending Sicilian and North Africa Maghrebids.

Variscan intrusive magmatism is evident only in the Aspromonte Unit. Cataclastic to mylonitic shear bands, related to Alpine tectogenesis, are widespread in all the units. They are accompanied by retrogressive processes or by relatively H-P and variable T metamorphic re-equilibration (Messina, 1995; Messina et al., 1992, 1995). Three of the Alpine units outcrop in the investigated area (Fig. 1). These are, from top to bottom: the...
Technical Note  Continued from Page 5

Aspromonte Unit, the Mela Unit and the Mandanici Unit; these units occupy the higher structural position of the Peloritani Mountains.

The Aspromonte Unit consists of a Variscan crystalline basement made up of heterogeneous low to upper amphibolite facies metamorphics intruded by syn- to post-tectonic plutonites. The Mela Unit, tectonically interposed between the Mandanici and Aspromonte Units, consists of a metamorphic basement made up of beds of paragneiss passing to mica schist, with subordinate lenses of metabasite and layers of impure marble.

The Mandanici Unit is geometrically interposed between the overlying medium-grade Mela Unit and the underlying low grade Fondachelli Unit; locally it is tectonically overlain by the Aspromonte Unit. The Mandanici Unit consists of a Variscan basement, made up of greenschist to amphibolite facies metamorphics, with a localized Alpine greenschist facies overprint, and of a Mesozoic sedimentary cover.

MINERALIZATION

The follow-up survey area (Fig. 2) is made up by two catchment basins: 1) a north-western one, occupied by the Vallone Monastri and smaller tributaries of Vallone Pularlo; the creeks of this catchment basins drain the Pizzo Mualio, Pizzo Cipolla, Pizzo Acquabianca, Rocca di Vernava, Pizzo Ruggeri mountains; 2) a southern one occupied by the Vallone Mangiarano, a tributary of Fiumara Dinarini; this creek drains Pizzo Mualio, Pizzo Cipolla, Pizzo Cafi, Pizzo Rotolia mountains. In the areas surrounding the follow-up area survey, Pb, Zn, Ag, Sb (with Au as by-product) were mined in the past at several localities, notably Bafia - Val Pomia and S. Carlo - Tripi (Fig. 1) (De Vivo et al., 1993).

In the Mandanici Unit the mineralization occurs in all the three lithotypes making up the Unit: a) in phyllites, as galena, antimonite, fluorite, sphalerite, pyrrhotite, chalcopyrite, pyrite, arsenopyrite, tetrahedrite and some Au (as by-product up to 0.2 ppm at Tripi, Bafia, Vacco and Migliuso); since the 1960's scheelite anomalies have been identified in many localities (IDROGEO Int., 1986a, b); b) in phyllites at the contact with overlying Mela Unit, as pyrite, chalcopyrite, arsenopyrite, Ag-sulfsals, with Au content lower than 1 ppm (Torrente Vacco and Fiumedinisi); c) in the marble horizons, as an association of tetrahedrite, antimonite, scheelite and Fe-Mn carbonates (at Fiumedinisi). At Fiumedinisi, Sacca et al. (in press) report incredibly high Au concentrations (up to 17.5 ppm) in a quartz layer associated with pyrite, chalcopyrite, rare arsenopyrite, and Fe-oxide (hematite, goethite, limonite).

In the Mela Unit, specifically in the follow-up area, mineralization occurs at Pizzo Mualio, in marbles as dykes containing arsenopyrite and pyrite (with 0.02 ppm Au), with traces of Zn, Pb, Ag and Cu. At Pizzo Cafi, in the marbles, occur barite with Zn, Ag and Au traces. Polymetallic sulphides occur as well in mica schistis and gneisses. In dykes crosscutting schistosity, arsenopyrite (with Au traces) with Cu, Zn and Ag occurs at Pizzo Ruggeri. The same mineralization occurs at Pizzo Cipolla and Pizzo Acquacalda.

Evidence of disseminated mineralization in dykes and “stockworks” of sphalerite with galena, chalcopyrite (with presence of Ag and Au) occurs in the shear zone along the contact between the Mela and Mandanici Units.

Other evidence of mineralization in the follow-up survey area is given by small oxidized gossans (limonite) over altered sulphides (mostly pyrite).

PREVIOUS GEOCHEMICAL SURVEYS

Before this study two geochemical surveys were conducted in this sector of the Peloritani Mountains, one at regional level and one as follow-up, by the State Group ENI-RIMIN on behalf...
of the Ministero dell'Industria, del Commercio e dell'Artigianato (MICA) (De Vivo et al., 1993). In the regional survey a total of 1198 stream sediment samples were collected covering a total of 435 km² at a nominal density of 2.8 samples per km². As a result of the univariate and multivariate evaluation of the analytical data, the area between Vallone Pularlo, Pizzo Muailo and Pizzo Cafi, covering about 14 km² was identified as a Mualio and Pizzo Cafi, covering about 14 km². Univariate and multivariate statistical techniques have been utilized to analyze the samples discussed in this report, including atomic absorption spectrometry (AA), flame atomic absorption spectrometry (FAA), graphite furnace atomic absorption spectrometry (GFAA), and inductively coupled plasma atomic emission spectrometry (ICP-AES).

ICP-AES multi-element analysis was done using the procedure of Lichten et al. (1987). Arsenic was determined by chemical separation/GFAA using the procedure for coal developed by Arscavage (1977). Silver was determined by chemical separation/GFAA following the method of Arscavage and Campbell (1979). Lead was done by FAA (Arscavage and Crock, 1987). Analysis of Pb (<20 ppm) was done by GFAA using an ammonium phosphate matrix modifier. Mercury was analyzed by cold vapor AA using the method of Flanagan et al. (1982). Gold was extracted into MIBK, then the organic layer was analyzed for Au by GFAA (Meier, 1980). Precision expressed as percent relative standard deviation is as follows; ICP-AES = 5-7, FAA = 0.4-0.98, GFAA = 0.78-1.37. In some cases detection limits; Au = 2 ppb, Hg = 20 ppb, Co = 10 ppm (for 80 mesh). Various chemical techniques have been utilized to analyze the samples discussed in this report, including atomic absorption spectrometry (AA), flame atomic absorption spectrometry (FAA), graphite furnace atomic absorption spectrometry (GFAA), and inductively coupled plasma atomic emission spectrometry (ICP-AES).

**RESULTS**

The statistical parameters from the data of the three grain fractions are presented in Table 1. Figures 3, 4 and 5 show the distribution of anomalous Au values for the three grain fractions analyzed. The grain fraction A indicates highly anomalous concentrations for Au (>80 ppb and up to 2.9 ppm) in the Fiurnara Dinarini draining Pizzo Cappara and Pizzo Cipolla catchment areas (Fig. 3). Fraction B indicates as well anomalous values in the same area but the number of markedly anomalous samples is lower, and with lower concentrations (> 80 ppb and up to 2.5 ppm) (Fig. 4). Fraction C indicates anomalous values.

---

### Table 1 - Summary statistics of stream sediment data.

<table>
<thead>
<tr>
<th>Elements</th>
<th>N.</th>
<th>Range</th>
<th>Mean</th>
<th>St.dev</th>
<th>Geom.M.</th>
<th>Range</th>
<th>Mean</th>
<th>St.dev</th>
<th>Geom.M.</th>
<th>Range</th>
<th>Mean</th>
<th>St.dev</th>
<th>Geom.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe (%)</td>
<td>95</td>
<td>1.83 - 7.47</td>
<td>4.17</td>
<td>0.78</td>
<td>4.1</td>
<td>2.05 - 7.5</td>
<td>4.44</td>
<td>0.78</td>
<td>4.37</td>
<td>93</td>
<td>2.7 - 7.5</td>
<td>5.10</td>
<td>0.79</td>
</tr>
<tr>
<td>Mg (%)</td>
<td>95</td>
<td>0.7 - 3.65</td>
<td>1.82</td>
<td>0.40</td>
<td>1.78</td>
<td>0.8 - 3.6</td>
<td>1.94</td>
<td>0.40</td>
<td>1.90</td>
<td>95</td>
<td>0.9 - 3.6</td>
<td>2.2</td>
<td>0.42</td>
</tr>
<tr>
<td>Al (%)</td>
<td>85</td>
<td>6.4 - 11.8</td>
<td>8.22</td>
<td>0.71</td>
<td>8.2</td>
<td>6.9 - 11.8</td>
<td>8.52</td>
<td>0.72</td>
<td>8.49</td>
<td>95</td>
<td>7.3 - 12.2</td>
<td>8.82</td>
<td>0.81</td>
</tr>
<tr>
<td>Cu (%)</td>
<td>95</td>
<td>0.2 - 7.5</td>
<td>1.48</td>
<td>0.86</td>
<td>1.33</td>
<td>0.27 - 6.15</td>
<td>1.52</td>
<td>0.78</td>
<td>1.37</td>
<td>95</td>
<td>0.37 - 6.8</td>
<td>1.94</td>
<td>1.24</td>
</tr>
<tr>
<td>Ti (%)</td>
<td>95</td>
<td>0.34 - 0.4</td>
<td>0.5</td>
<td>0.09</td>
<td>0.49</td>
<td>0.38 - 0.95</td>
<td>0.54</td>
<td>0.10</td>
<td>0.53</td>
<td>95</td>
<td>0.47 - 0.94</td>
<td>0.62</td>
<td>0.10</td>
</tr>
<tr>
<td>Zn (ppm)</td>
<td>95</td>
<td>58 - 733</td>
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<td>95</td>
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<td>755</td>
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<td>737</td>
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<td>18</td>
<td>43</td>
<td>95</td>
<td>25 - 134</td>
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<td>6</td>
<td>17</td>
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<td>10 - 57</td>
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<td>Cr (ppm)</td>
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<td>95</td>
<td>30 - 188</td>
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<td>16</td>
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<td>Hg (pppb)</td>
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<td>95</td>
<td>20 - 130</td>
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**SAMPLING AND ANALYTICAL METHODS**

A total of 95 stream sediment samples have been collected over an area of =7 km² at a nominal density of 14 samples per km², along the small creeks, tributaries of Fiurnara Dinarini and Vallone Pularlo. The steep slopes of the investigated area have hampered the use of soils as a sampling media in this stage of the project. In establishing the sampling grid, some sampling sites were located in the same place of the previous survey, in order to check the validity of analytical results already obtained (De Vivo et al., 1993).

At each sampling site about 20 kg of sediments, to a depth of 50 cm below the surface, were collected. The samples were dried and sieved to obtain 3 grain fractions: A: > 250 μm (60 mesh); B: between 250 and 177 μm (60 - 80 mesh); C: <177 μm (80 mesh).

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Continued on Page 8
with generally lower concentrations compared with fraction A (Fig. 5), but the anomalies are much more spread all over the catchment area of Fiumara Dinarini draining Pizzo Cappara and Pizzo Cipollà (> 80 ppb and up to 3.3 ppm). In the same drainage basins (i.e., Vallone Monastri and the upper portion of Fiumara Dinarini) occur anomalous values for Fe, Zn, Mn, Cu, Co, Cr, Ni, Ag, Sb, As and Pb for the three analysed grain fractions, but the concentrations are markedly higher for the finer fraction C (<177 μm). Worth mentioning is the grouping of high values for elements such as As, Sb, and Ag in the same drainage basins where Au anomalies occur.

The distribution of the elements in different grain-size fractions shown on the box plots (Fig. 6) indicates that elements such as Cu, Co, Ni, Sb, As, Cr, Mn, Pb and Zn have concentration values which progressively increase from the coarser fraction (A) to the finer fraction (C), whereas this is not true in the same extent for Au and Ag. The box plots of Au shows that a trend of increasing Au values is recorded in the finer fraction. Probably the benefits of using the finer fraction to check the variability of Au distribution, would have become more apparent if fractions finer than 100 μm were used.

At each sampling site in a stream network, the mineral content of the sediments can be influenced by a number of factors. Active stream sediments are subjected to various sorting processes related to the ability of the flow to differentially transport grains of variable physical characteristics. The deposition or entrainment can be influenced by grain size, density and shape (Reid and Frostick, 1985; Slingerland and Smith, 1986), but the effectiveness of each process varies according the geomorphological control (Hughes et al., 1995). In our case the data show that the median value of the box plot increases, though not markedly, in the finer fraction (< 177 μm) compared with the other two coarser fractions (A and B). This is not surprising; in fact, the use of fine-grained fractions for search for Au, has been used successfully elsewhere for gold prospecting, as in Australia and China (Elliott and Towsey, 1989; Salpeteur and Sabir, 1989; Xie and Wang, 1991).

R-mode factor analysis of results for the grain fractions A, B and C, using 16 variables indicates a 4-factor model as the most appropriate to explain mineralization in the area (Table 2). As for the single element anomaly distribution, the highest factor...
Technical Note  Continued from Page 8

Fig. 6 - Box plots showing the distribution of Ag, Cu, Co, Ni, Sb, As, Cr, Mn, Pb, Zn and Au in grain fractions A, B and C

scores fall in the upper portion of Fiumara Dinarini, namely in the drainage area of Pizzo Cappara and Pizzo Cipolla. The associations F3 (As-Au-Cu-Sb), F1 (Sb-Ag-Au-As-Pb) and F3 (Au-As-Sb-Ag), respectively for the grain fractions A, B and C, represent precious metal mineralization, whereas the other factor associations (F2 for fraction A; F2 for fraction B and F4 for fraction C) represent base-metal sulphide mineralization. Also for R-mode factor analysis the best response to the presence of base metal sulphide and Au mineralization is given by the data from the finer fraction (C; < 177 μm). The distribution of association factor scores interpreted as the most appropriate to explain the base metal sulphide and Au mineralization in the area for the grain fraction C is shown on figure 7.

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<td>Cr</td>
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<td>Var. %</td>
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Table 2 - Varimax-rotated factor matrix (4-factor model), log-transformed stream sediment data. Loadings > | 0.4 | are underlined.

CONCLUSIONS

The most relevant result of this geochemical study is the confirmation of the results already obtained in the previous study by De Vivo et al. (1993). Specifically, the concentrations of Au found in this follow-up survey are even higher than the previous study. In addition, it has been demonstrated that the finer grain fraction size is most effective for the identification of Au anomalies in the study area. The median values of Au concentrations tend in fact to increase in the finer fraction (< 177 µm). The finer fraction also is a critical factor in the control of the distribution of the other anomalous elements (As, Sb, Zn, Cu and Pb).

An additional confirmation of the results obtained in the previous survey, has been a clear identification of the source of the Au anomalies. The anomalous samples drain the thrust front of three tectonic units: the Mela and Aspromonte Units over the Mandanici Unit, specifically the front along the watershed which extends from Pizzo Cafì, to Pizzo Cappara, Pizzo Cipolla and west of Pizzo Cipolla (Figs. 3 - 5). This thrust front is thus the primary target for a detailed exploration program. The anomalous area identified by means of the previous (De Vivo et al.; 1993) and the present follow-up survey is now covered by a research permit (released by the Regional Sicilian Mining Authority) designed to evaluate the economic potential of the study area.

Fig. 7 - Distribution of F3 (Au-As-Sb-Ag) and F4 (Zn-Pb-Ag-Mn-Sb) association factor scores from log-transformed stream sediment grain fraction C.

Fig. 8 - Mineralisation model of Peloritani Mountains.
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The primary source of Au anomalies remains still speculative, but the presence of intercalations of basic volcanics in Aspromonte, Mela and Mandanici Units, make these rocks plausible candidates for such origin (Fig. 8). In this view, the auriferous anomalies might be related to primary Hercynian volcanogenic deposition; Au and As, Sb, Ag + base metal sulphides might have been remobilized during subsequent metamorphic processes (Sacca et al., in press) and deposited along the shear zone, occurring along the thrust between the Aspromonte, Mela and Mandanici Units.

ACKNOWLEDGEMENTS

We acknowledge the high quality chemical analyses by R. J. Knight, J. B. McHugh, R. M. O’Leary, B. H. Roushey (Au and Hg at U.S.G.S., Denver, CO) and C.J. Skeen (As, Sb, Ag, Pb by ICP-AES at U.S.G.S., Reston, VA).

REFERENCES


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■ May 18-20, 1998, Geological Association Canada/Mineralogical Association Canada, Quebec, Canada. INFORMATION: A Morin, Dept. Geologie et de genie geologie, Universite Laval, Pavillon Adrein-Pouliot Sanite-Fay, Quebec, G1K 7P4 Canada. TEL: 418-656-2193. FAX 418-565-7339; includes a 2.5 day pre-meeting MAC short course entitled Mineralized Porphyry-Skarn Systems, INFORMATION (for the short course only) Dave Lentz, TEL: (506) 547-2070; FAX:(506) 547-7694.

■ May 22-27, 1998, Geochemistry of Crustal Fluids: Characterization of Reactive Transport in Natural Systems, Aghia Pelaghia, Crete. INFORMATION: J. Hendekovic, European Science Foundation, 1 Quai Lezay-Marnesia, 67080 Strasbourg Cedex, France, e-mail: euresco@esf.org.


■ July 4-11, 1998, Geological Society of America Penrose Conference on “Processes of Crustal Differentiation: Crust-Mantle Interactions”, Verbania, Italy. INFORMATION: T. Rushmer, Dept. of Geology, University of Vermont, Burlington, VT 05405, 802-656-8136, FAX: 802-656-0045, e-mail: trushmer@zoo.uvm.edu.


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■ September 22-25, 1998. International Meeting of Gold Exploration and Mining in NW Spain, Oviedo, Spain. INFORMATION: Daniel Arias Prieto, Facultad de Geología, Universidad de Oviedo C/Arias de Velasco s/n, 33005 Oviedo, Spain. FAX (34)8-5103087. Email: arias@asturias.geol.uniovi.es.


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Fax: 02 6201 5728
e-mail taylor@science.canberra.edu.au or kovacs@science.canberra.edu.au

■ May 26-28, 1999, Geological Association of Canada-Mineralogical Association of Canada Joint Annual Meeting, Sudbury, Ontario, Canada. INFORMATION: Dr. P. Copper, Dept. of Earth Sciences, Laurentian University, Sudbury, Ontario P3E 2C6, TEL. 705-675-1151 (ext. 2267), FAX: 705-675-4898, e-mail: gacmac99@nickel.laurentian.ca.


■ April 24-28, 2000, 5th International Symposium on Environmental Geochemistry, Cape Town, South Africa. INFORMATION: 5ISEG, Department of Geological Sciences, University of Cape Town, Private Bag, Rondebosch, 7701, South Africa, FAX: 27-21-650-3783. Email: 5iseg@geology.uct.ac.za.

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Student status must be verified by a Professor of your institution or a Fellow of the Association of Exploration Geochemists. I certify that the applicant is a full-time student at this institution.

(Signature) __________________________

(Printed Name and Title)

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(to be completed by all applicants)

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All applications must be accompanied by annual dues. Select one or two below:

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