TNA REPORT:

Project Title: Characterisation of the bio-mineralogical and isotope geochemical signatures of life in an extreme environment: Río Tinto Spain.

Date: October, 13th -17th of 2010.

Researchers funded by the TNA project:
- Dr. Pieter Vroon, Department of Petrology, VU University of Amsterdam, The Netherlands.

- Esther Velasco, Department of Petrology, VU University of Amsterdam, The Netherlands.

Researchers self funded but joining the entire field campaign:

- Prof. Gareth Davies, Department of Petrology, VU University of Amsterdam, The Netherlands.

- Dr. Wilfred Röling, Department of Molecular Cell Physiology, VU University of Amsterdam, The Netherlands.

Researchers from the CAB:
- Dr. Felipe Gómez, Centro de Astrobiología, Torrejón de Ardoz, Madrid, Spain.

- Prof. Ricardo Amils, Centro de Astrobiología, Torrejón de Ardoz, Madrid, Spain

AIM OF THE FIELD WORK:

Take the main points from the application and make a series of bullet points;

Goal was to characterise …
take representative samples from….
Water of variable pH- Eh etc
Sediments
biology

PROGRAM:

- Wednesday 13/10/2010:
  - Arrival to Rio Tinto from 14-15h
  - 17-19 Introduction to Rio Tinto (from Dr. Felipe Gómez)

- Thursday 14/10/2010:
  - Sampling point “DAM locality 3.2” from 11-14h
  - Sampling point “Moguer” from 16:15-17:00h

- Friday 15/10/2010:
  - Sampling point “La Marismilla” from 10-10.30

    - Sampling point “Los Frailes” train station from 13.30-13.45
    - Sampling point “Berrocal” 16:35-17
    - Sampling point “La casa de los sordos” from 17:45- 18

- Saturday 16/10/2010:
    - Sampling point “Origin” from 9:20-11:45
    - Sampling point “Peña de Hierro, mine exit” from 12:15-12:30h
    - Sampling point “Anabel’s Garden” 13:15- 13:45h
    - Sampling point “Gossan unit from the top of Peña de Hierro” 17:15-17:30
    - Sampling point “El Cementerio” 18- 18:45
- Sunday 17/10/2010:
    - Departure from Rio Tinto.

Features from the sampling points:

ANABEL’S GARDEN:

Sampling point from the source of the river near to the Peña de Hierro mining area (37°43'29.87"N, 6°33'36.16"W), where small streams both reduced and oxidized waters are mixed.

BERROCAL:
Sampling point located in the middle course of the river, in the south of the town of Berrocal (37°35'35.88"N, 6°33'2.51"W)

DAM 3.2:
Dam situated close to the source of the river, in the south of Anabel’s garden sampling point, near to the Peña de Hierro mining area (37°43'17.36"N, 6°33'46.85"W).
In this point, it is found a water pool up to 6 m depth, where it is possible to find stratified water from oxic (Fe^{3+}) to anoxic (Fe^{2+}) waters, but in the week that we were taking samples, we couldn’t find the stratified waters.

EL CEMENTERIO (OLD TERRACES):
Sedimentary deposits next to the town of Nerva’s cementery.
The deposits are some old terraces (~ 1 my) rich in goethite and hematite.

EL CEMENTERIO (WATER SAMPLES):

Water exit from inside the “Rio Tinto” mine, in front of the Nerva’s cementery, which are rich in Cupper.

GOSSAN UNIT FROM THE TOP OF PEÑA DE HIERRO:
Gossan outcrop from the top of the “Peña de Hierro” mine (37°43'29.26"N, 6°33'13.41"W)

LA CASA DE LOS SORDOS:

Sampling point in the middle course of the river (37°35'1.81"N, 6°33'0.72"W), in the confluence between the Rio Tinto river and the Telliscas stream (with normal fresh water).

LOS FRAILES:
Train stop of the old mining railway, located in the middle course of the river, in the north of the town of Berrocal (37°37'37.39"N, 6°32'16.19"W).

MARISMILLA:
Dam close to the town of Nerva (37°41'28.51"N, 6°33'37.53"W), close to the origin of the river, where the waste waters from Nerva are joined to the Rio Tinto waters, having an extra source of organic material in this point. It can be observed some important biofilms in this sampling point.

MOGUER:
Located in the estuary part of the river, in the "Parque del descubrimiento" from the town of Moguer (37°16'57.89"N, 6°50'59.76"W). This point is influenced both marine and Rio Tinto conditions, depending of the tidal state. It has been recorded changes of pH from 2 to 8.

ORIGIN:
Official origin of the Rio Tinto river, in the south of the "Peña de Hierro" mining area (37°43'17.99"N, 6°33'4.60"W).
It has 3 streams, one call II ("Izquierda-Izquierda"), another call I ("Izquierda" or left) and the last one call D ("derecha" or right).
The II stream usually has the highest concentration of ferric ion of all the river.

PEÑA DE HIERRO MINE EXIT:
Water exit from inside the "Peña de Hierro" mine (37°43'30.31"N, 6°33'21.61"W), which is reduced (Fe^{2+}). It is observed a high quantity of algae. This may due to the Fe^{2+}-rich waters are more clear (greenish to transparent waters) than the Fe^{3+}-rich waters (red waters).

ASSESSMENT OF THE FIELD WORK:

The major goals of this first field work in the Rio Tinto area where achieved. Following Dr Gomez excellent introduction to the region the research group is now familiar with the major geological and biological environments of the area. This enabled a diverse series of water samples, river sediments and a limited number of rock and mineral samples to be obtained. The short nature of the visit means that we cannot claim to have made a thorough study of the region. However, analysis of the current sample set will allow us to address specific questions and give additional focus to future sampling. A full list of samples is provided in an Excel spread sheet.

The infrastructure support and knowledge of the region provided by the CAB team was outstanding. Logistics were also extremely well organised. The VU team would like to officially register their great thanks that the CAB team provided such excellent assistance.

Nos gustaría agradecer a Felipe Gómez y a Ricardo Amils por su inestimable ayuda y apoyo a la hora de elegir y aconsejar los puntos de muestreo, en Río Tinto, así como en su contribución a la hora de organizar el viaje a Río Tinto. Su gran conocimiento y experiencia trabajando en Río Tinto, nos permitió aprovechar el tiempo de muestreo con gran eficacia.

APPENDIX 1:
Excel file with samples taken from Rio Tinto.