

PHOTOGRAPHS

ЭНЦИКЛОПЕДИЯ

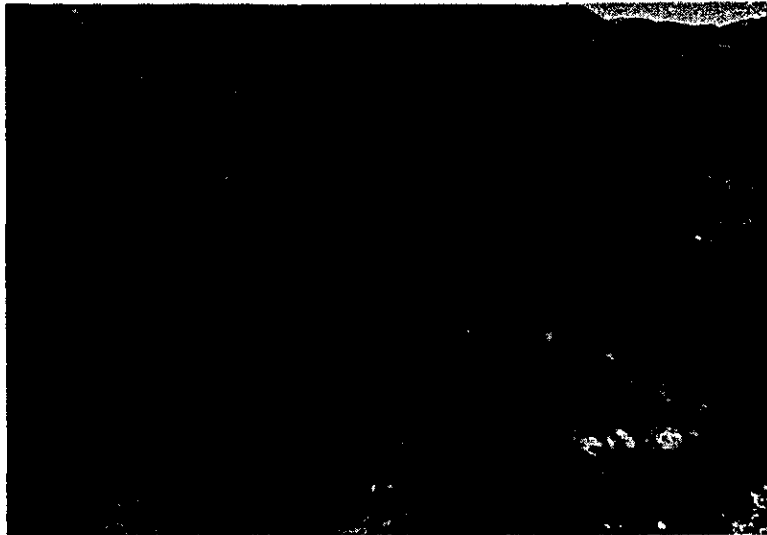


Photo. 1 General View of Juffa Gneiss, II-member consists mainly of mica gneiss
Loc. Wadi Shaat

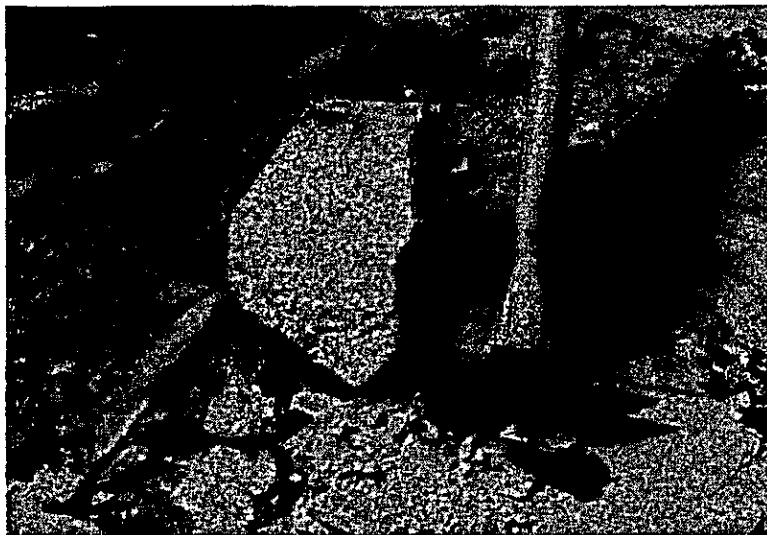


Photo. 2 Mica gneiss in II-member of Juffa Gneiss
Loc. Wadi Shaat

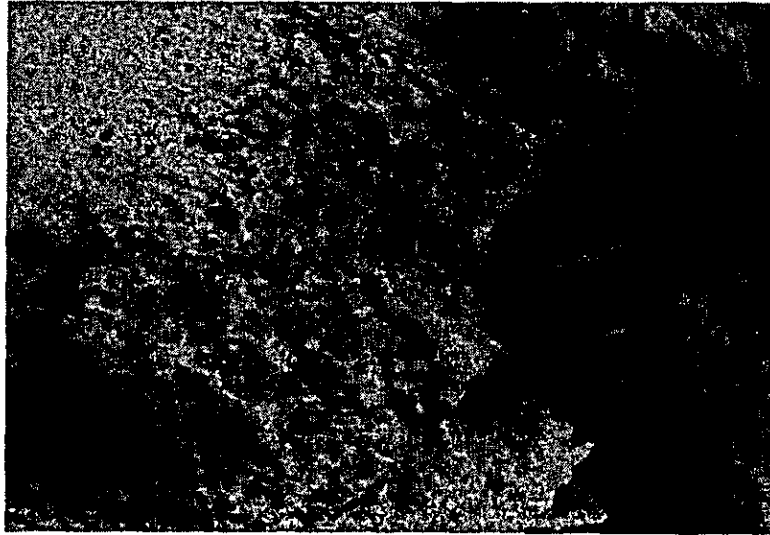


Photo. 3 Coarse grain Garnet in II-member of Juffa Gneiss
Loc. Wadi Ain



Photo. 4 Juffa Gneiss, I-member consists of alternation of mica
gneiss and basic gneiss
Loc. Wadi Bayt Said



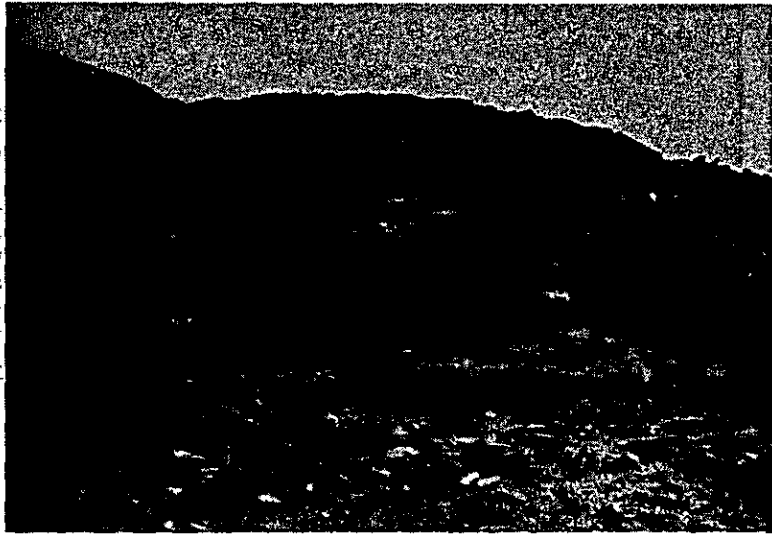


Photo. 5 Juffa Gneiss, I-member (alternation of mica gneiss and basic gneiss)
Loc. Wadi Shaat



Photo. 6 Juffa Gneiss, I-member intercalates basic gneiss
Loc. Wadi Bayt Said

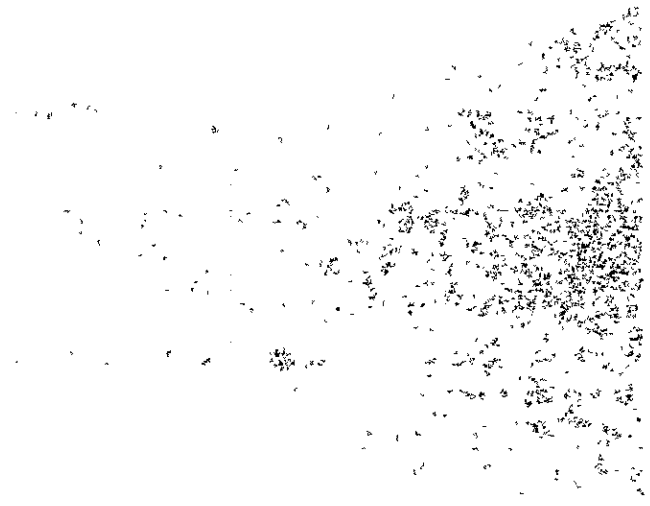




Photo. 7 Basic gneiss of Sadh Gneiss showing a minor folding,
cut by quartz veinlets
Loc. Wadi Atah



Photo. 8 Basic gneiss of Sadh Gneiss showing a minor folding
Loc. Wadi Anib





Photo. 9 Intermediate gneiss of Sadh
Gneiss
Loc. Wadi Anib

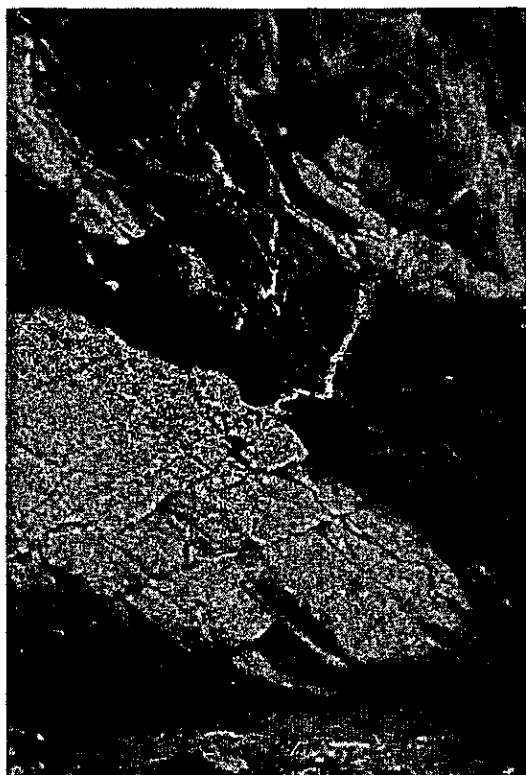


Photo. 10 Sada Gneiss consists of acidic
gneiss (black)
Loc. Wadi Anib



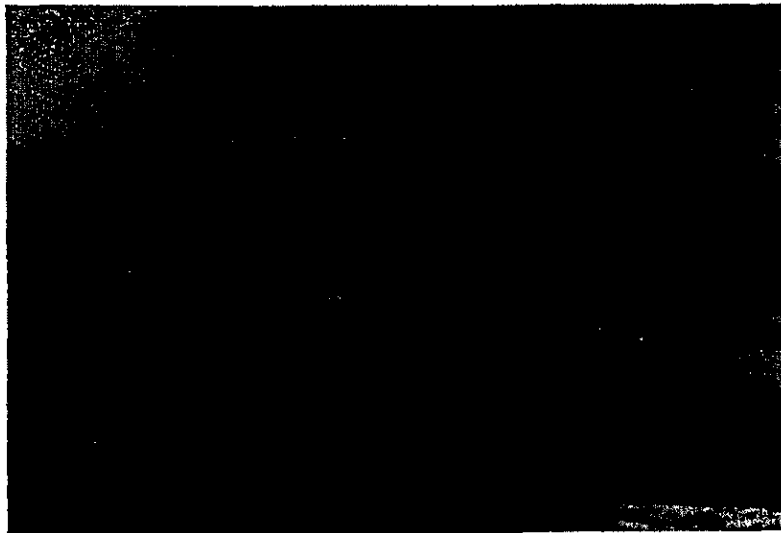


Photo. 11 Quartz rich pegmatite veins (white) intruded into
Sadh Gneiss
Loc. Wadi Hinun



Photo. 12 Potash feldspar rich pegma-
tite vein intruded into Sadh
Gneiss
Loc. Wadi Ain





Photo. 13 Quartz rich pegmatite (white) is cut by dolerite dyke (black)
Loc. Wadi Khornhant

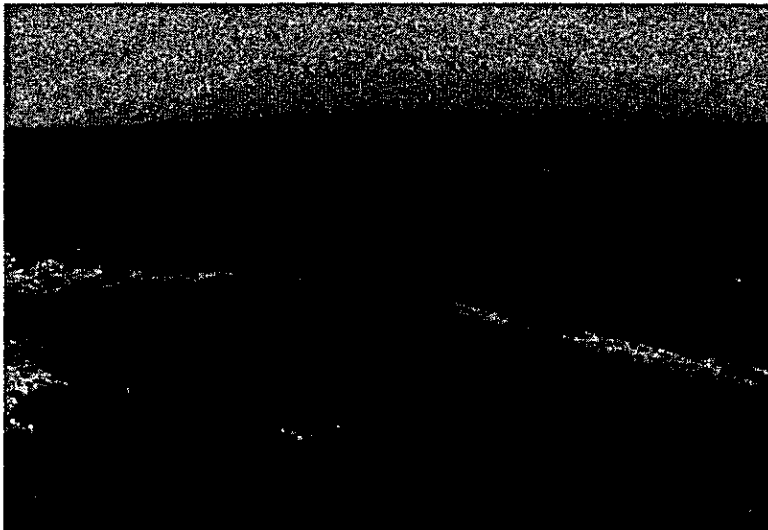
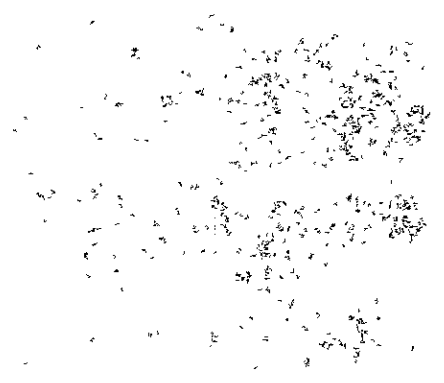
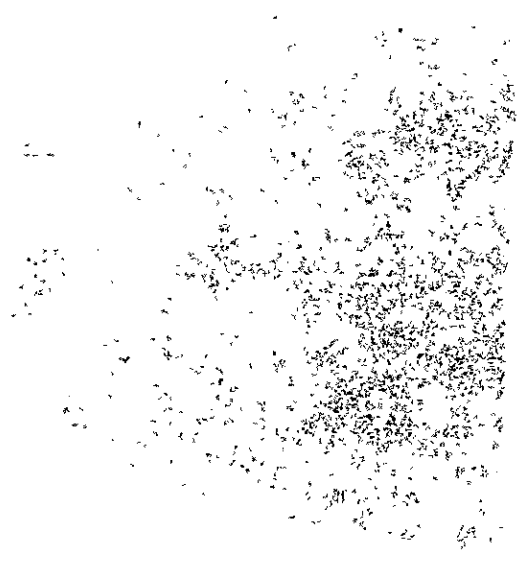


Photo. 14 Quartz rich pegmatites (white) are cut by acidic dyke (dark)
Loc. Wadi Khorhant



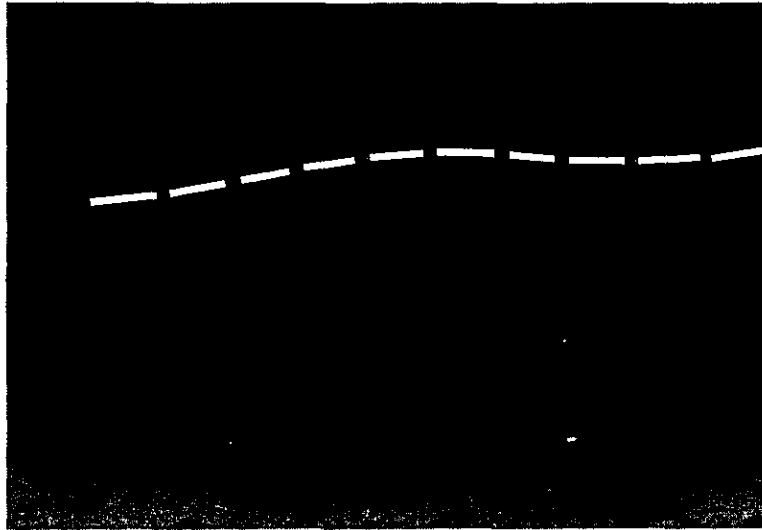
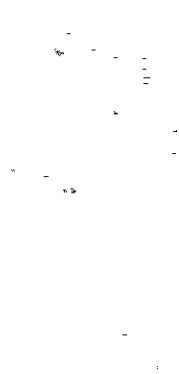
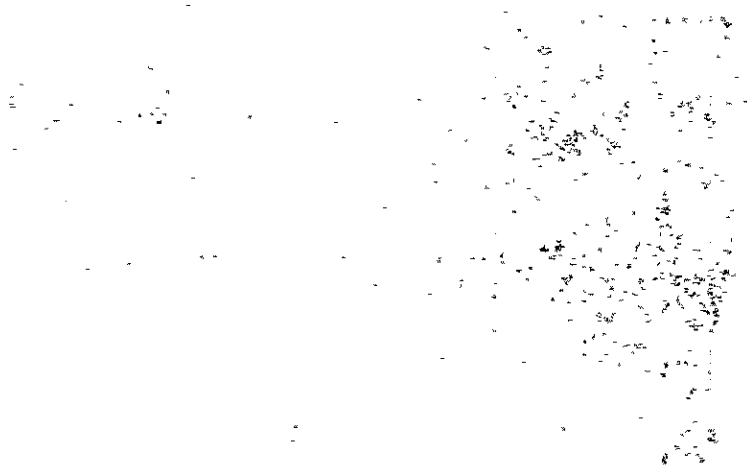


Photo. 15 Hadabin body (granodiorite to quartz diorite) is overlain by Umm er Radhuma Formation (Bedded limestone)
Loc. Hadabin



Photo. 16 Xenolith of Sakh Gneiss (dark) in Hadabin body
Loc. Wadi Fushi



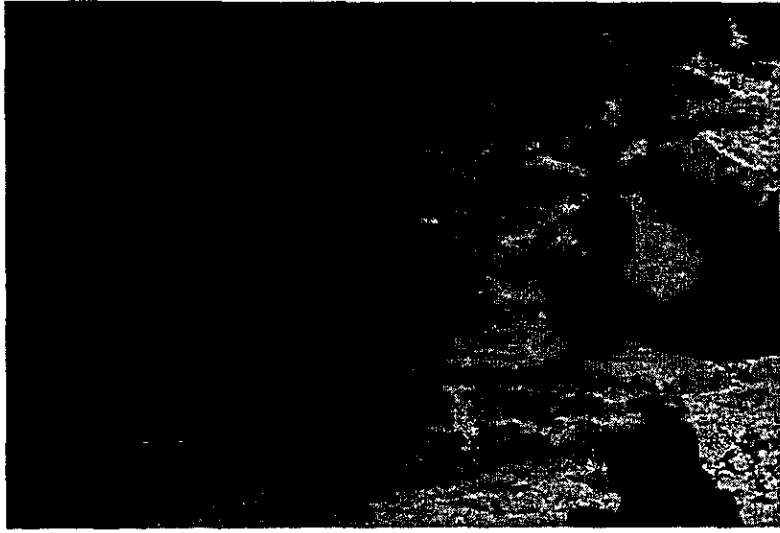


Photo. 17 Quartz monzonite (dark) intruded into Juffa Gneiss
Loc. Wadi Shiliyam



Photo. 18 Quartz monzonite hill
Loc. Wadi Shiliyam



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Photo. 19 Dolerite dyke intruded into Sadh Gneiss
Loc. Wadi Khornant

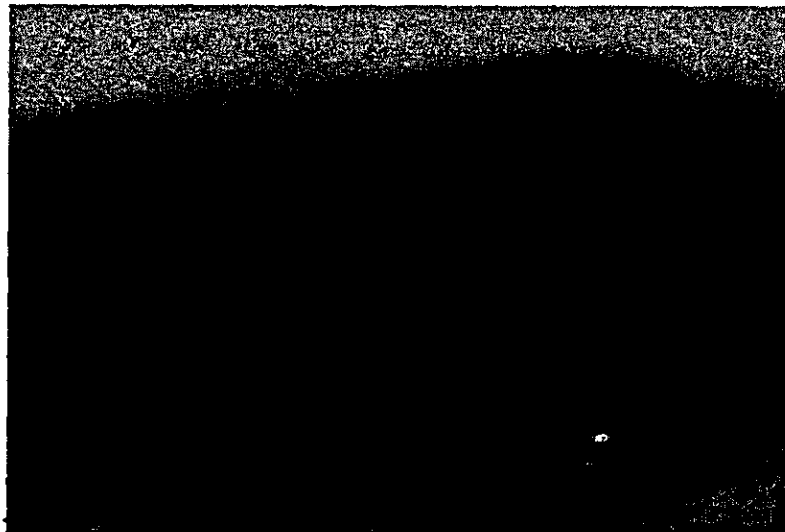


Photo. 20 Acidic dyke forming ridge of hills, intruded into Sadh
Gneiss
Loc. Mirbat--Juffa main road

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Photo. 21 Dolerite dyke (black) is covered by Mirbat Sandstone Formation shown with hammer
Loc. Wadi Bayt Said

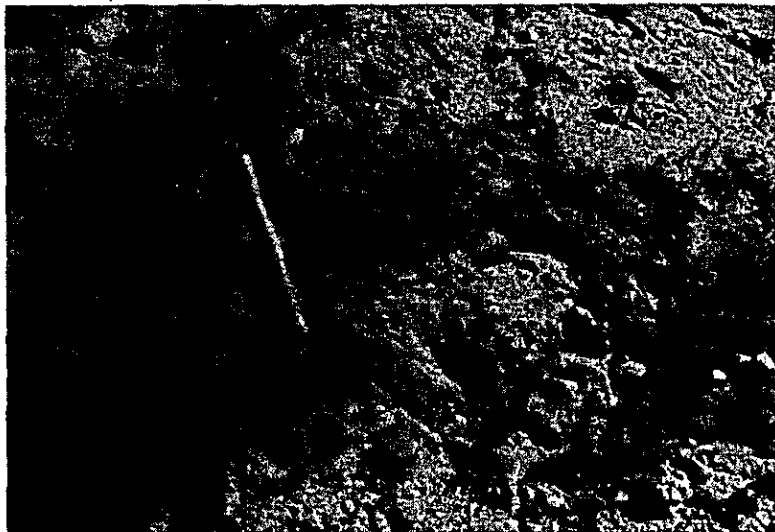


Photo. 22 Conglomerate in the lower member of Mirbat Sandstone Formation
Loc. Wadi Hinun



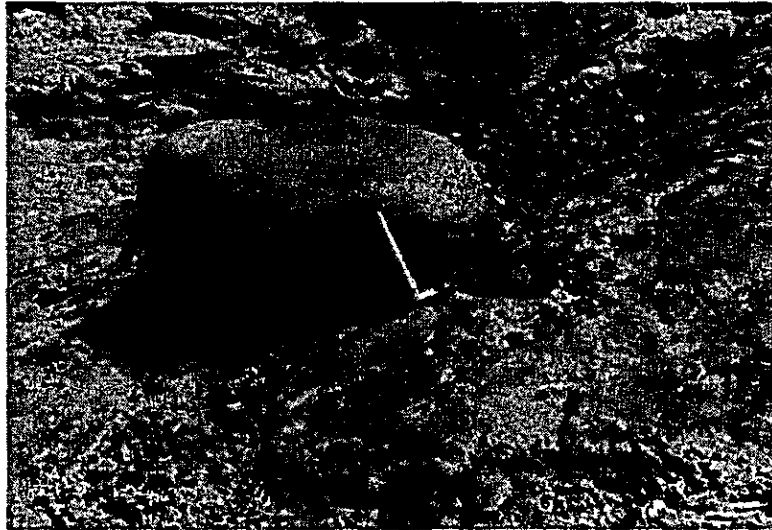


Photo. 23 A granodiorite boulder is observed in conglomerate bed of Lower member of Mirbat Sandstone Formation
Loc. Wadi Hinun

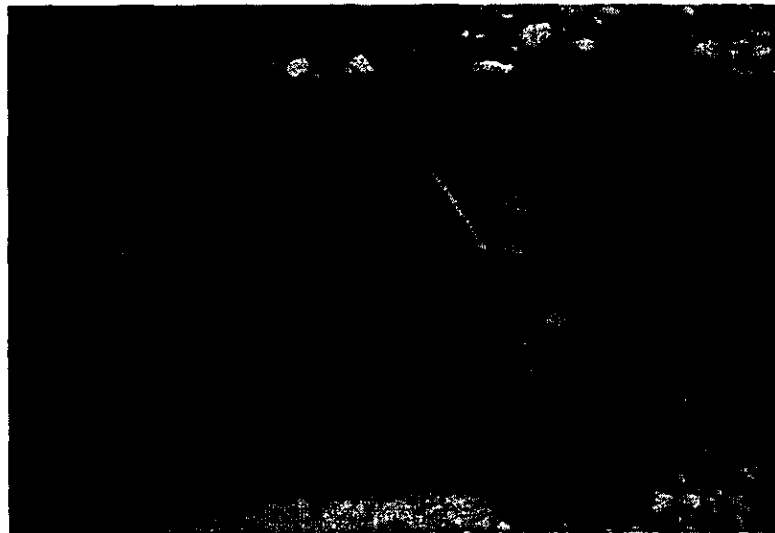


Photo. 24 Basal breccia consisting mainly of Sakh Gneiss is observed in Lower member of Mirbat Sandstone Formation
Loc. Wadi Ercahol

100

100

100

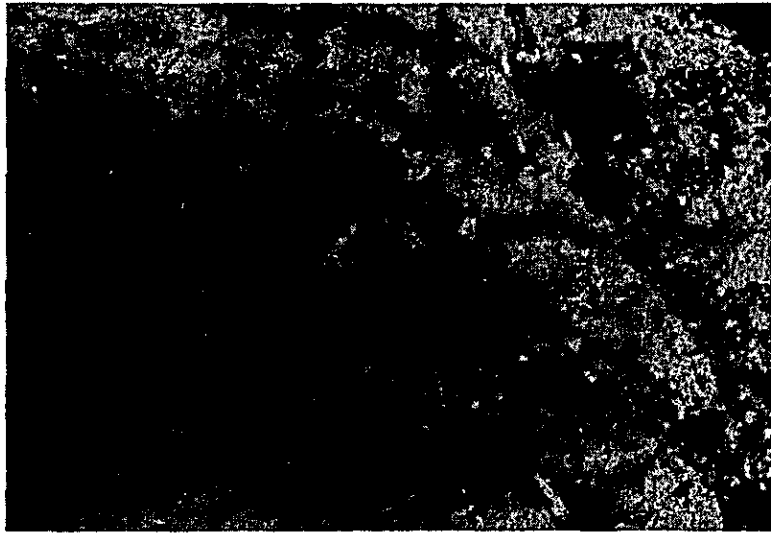


Photo. 25 Barite veins in Lower member of Mirbat Sandstone Formation
Loc. Wadi Ercahol

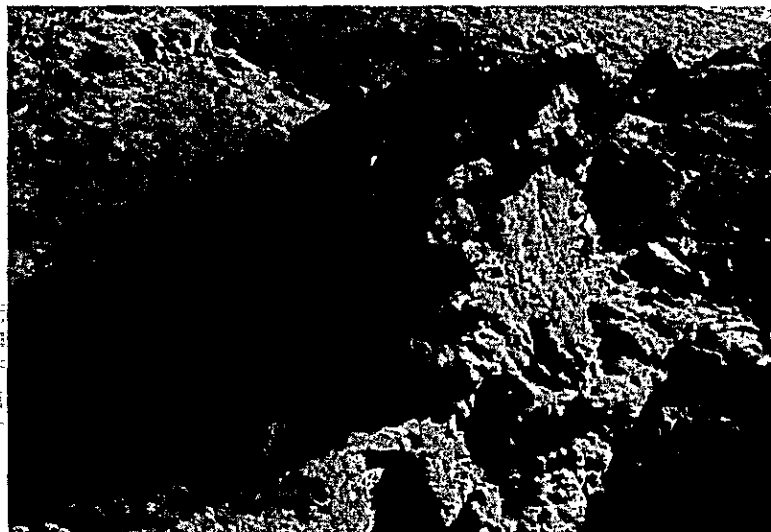
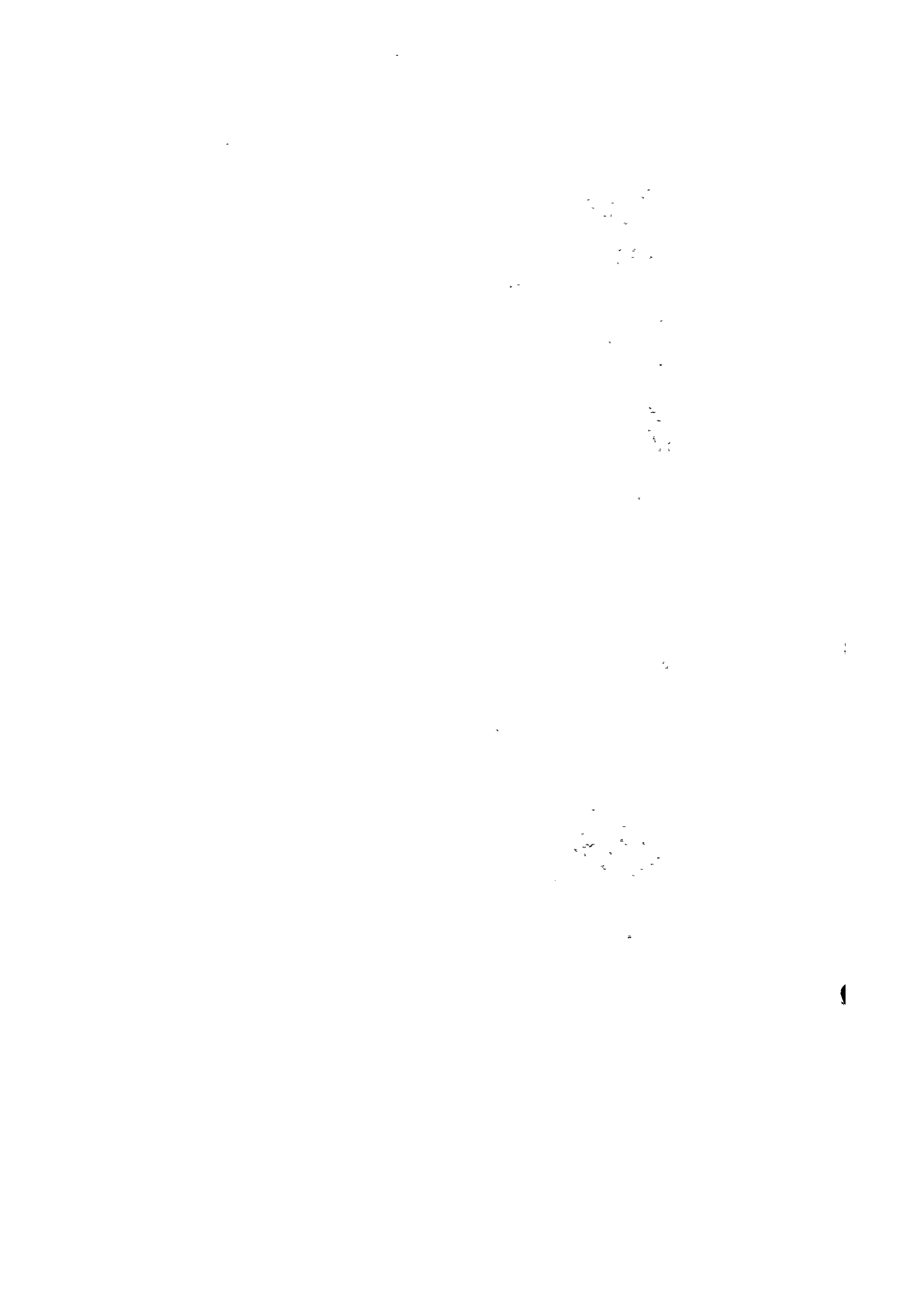


Photo. 26 Limestone (stinkstone) at the base of Middle member of Mirbat Sandstone Formation
Loc. Wadi Ercahol



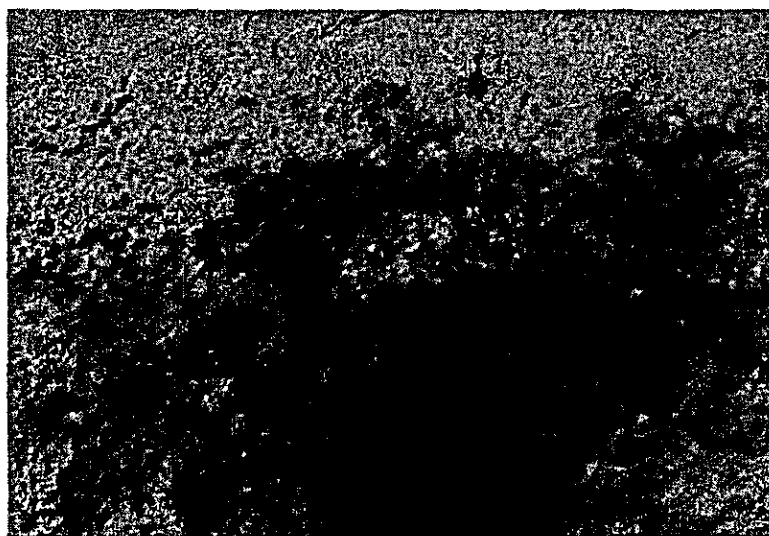


Photo. 27 Very coarse grain quartzose sandstone in Middle member of Mirbat Sandstone Formation
Loc. Wadi Hinun



Photo. 28 General view of Middle member of Mirbat Sandstone Formation
Loc. Wadi Ercahol

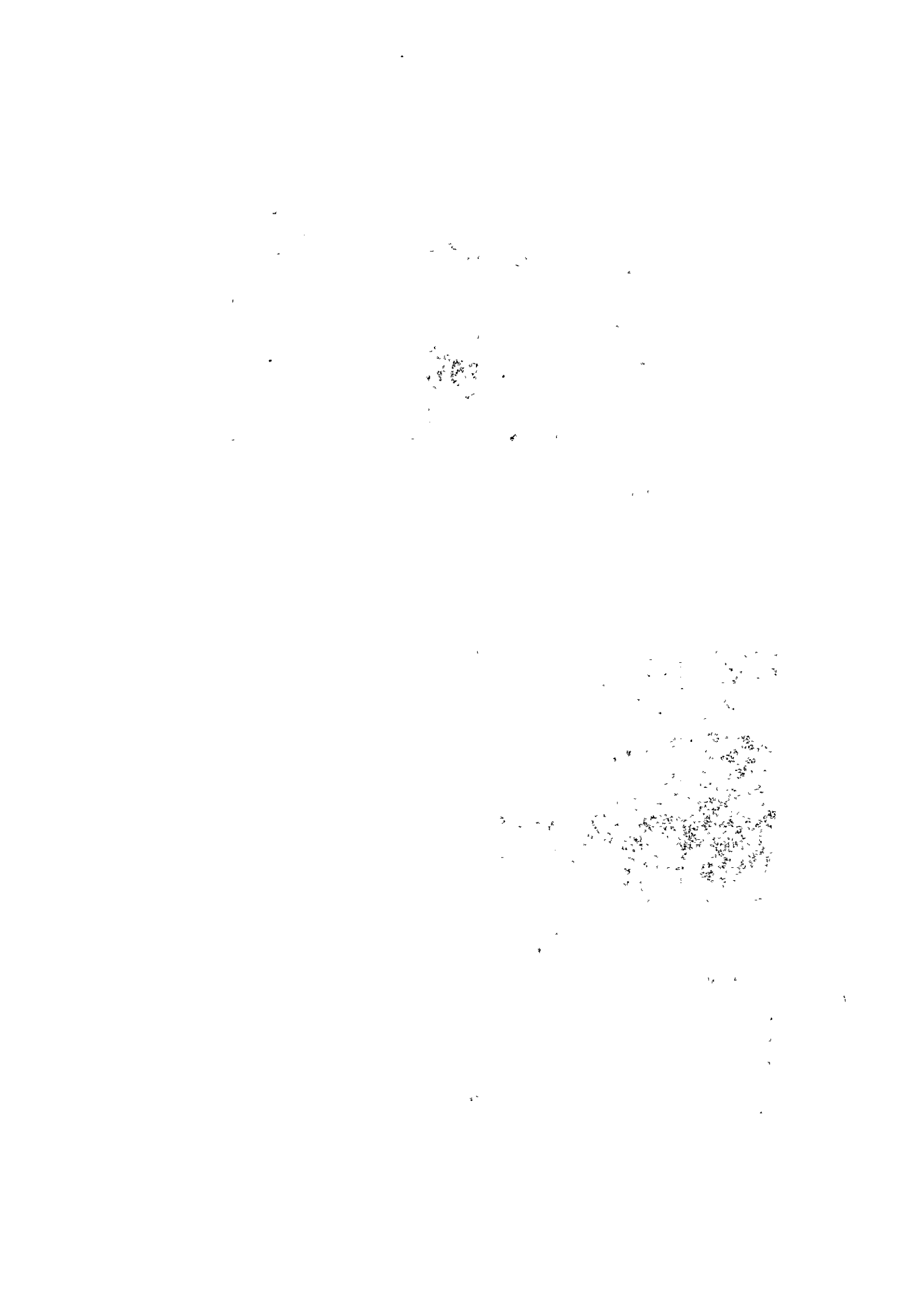




Photo. 29 Upper member of Mirbat Sandstone Formation is overlain by Umm er Radhuma Formation
Loc. Wadi Ercahol

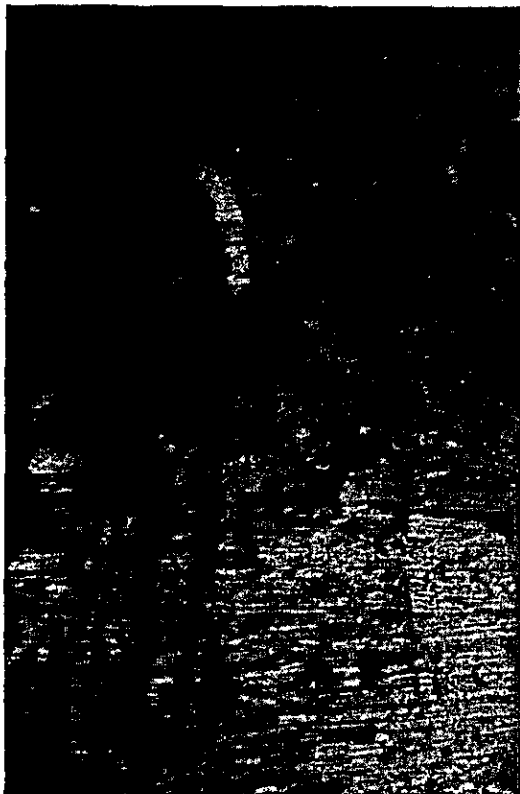


Photo. 30 Buff colour shale with intercalation of fine sandstone is observed in Upper member of Mirbat Sandstone Formation
Loc. Wadi Ercahol



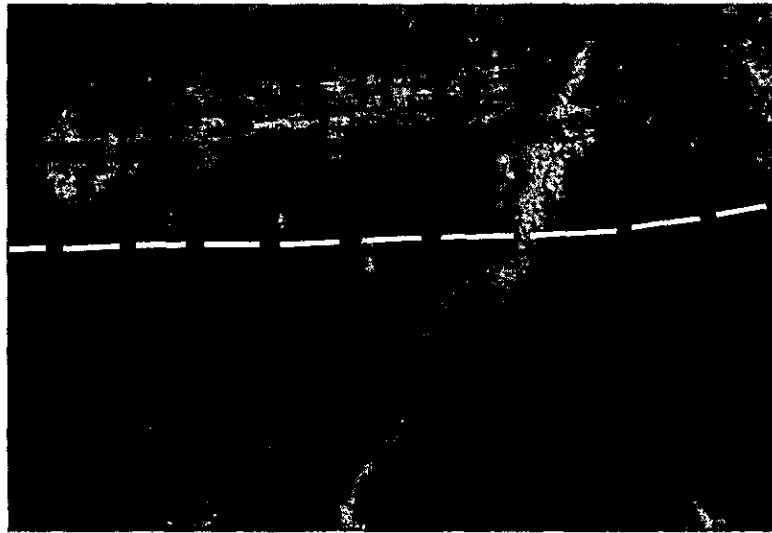


Photo. 31 Boundary of Umm er Radhuma Formation and Mirbat Sandstone Formation
Loc. Jabal Samhan

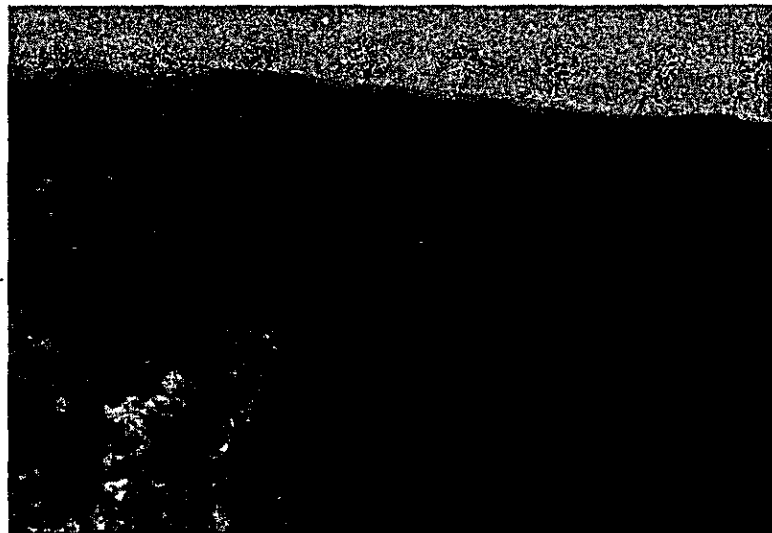


Photo. 32 General view of escarpment with Umm er Radhuma Formation
Loc. Jabal Samhan



Photo. 33 Umm er Radhuma Formation showing a well bedded structure
Loc. Jabal Samhan



Photo. 34 White unconsolidated sandstone at the base of Umm er Radhuma Formation
Loc. Wadi Maseer

APPENDICES

1. 2014

Fig. A-1 Microphotography of Thin Section

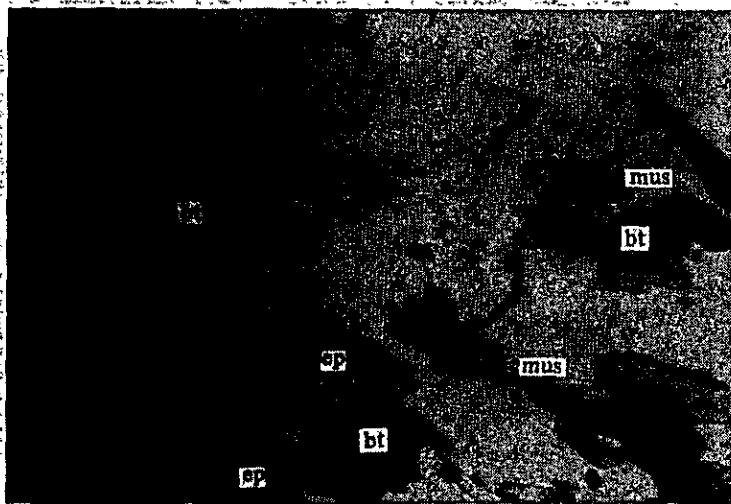
Abbreviations

q : quartz
pl : plagioclase
kf : potash feldspar
bt : biotite
mus : muscovite
hb : hornblende
au : augite
ga : garnet
op : opaque mineral
sph : sphene
ser : sericite
ep : epidote

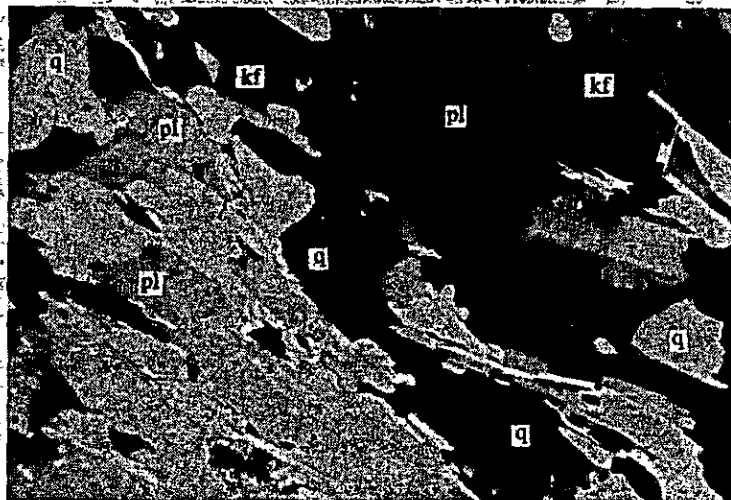
1. 2023年12月31日 10000000

2024

1. 2024年1月1日 10000000
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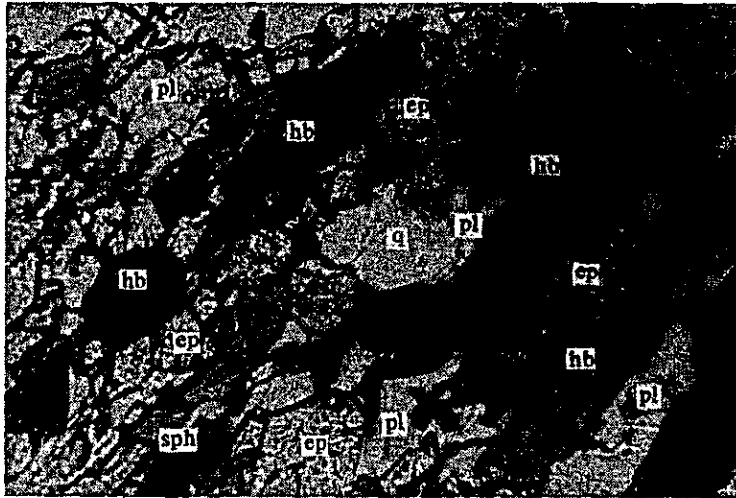


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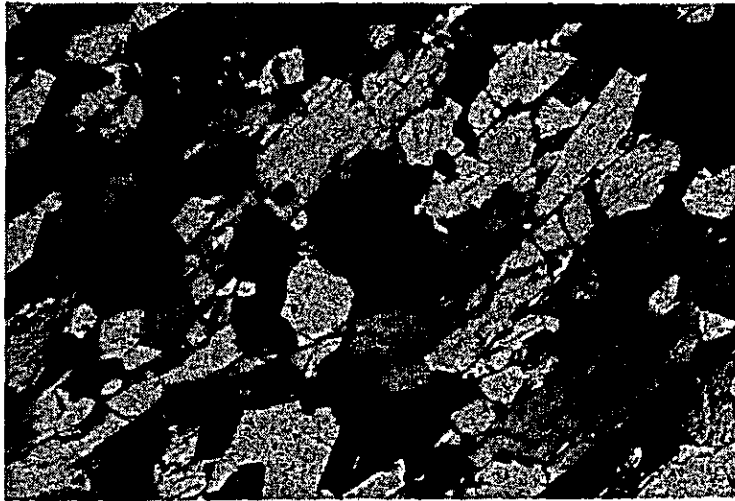
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- Sample No. : D-035
 Rock name : Muscovite biotite gneiss, Juffa Gneiss.
 Location : Wadi Bayt Said
 Observation : The rock is composed of quartz, K-feldspar, plagioclase, biotite, muscovite, garnet and others showing gneissose texture and myrmekitic texture.
 Quartz : Maximum 2.5 mm, anhedral.
 K-feldspar : Maximum 2 mm, anhedral to subhedral, showing microcline structure.
 Plagioclase : 0.4 to 1.3 mm, anhedral, partly altered to sericite.
 Biotite : Maximum 2 mm in length, partly altered to chlorite.
 Muscovite : Maximum 2.5 mm in length.
 Garnet : 0.05 to 0.5 mm, euhedral.
 Others : Epidote, apatite, opaque minerals.





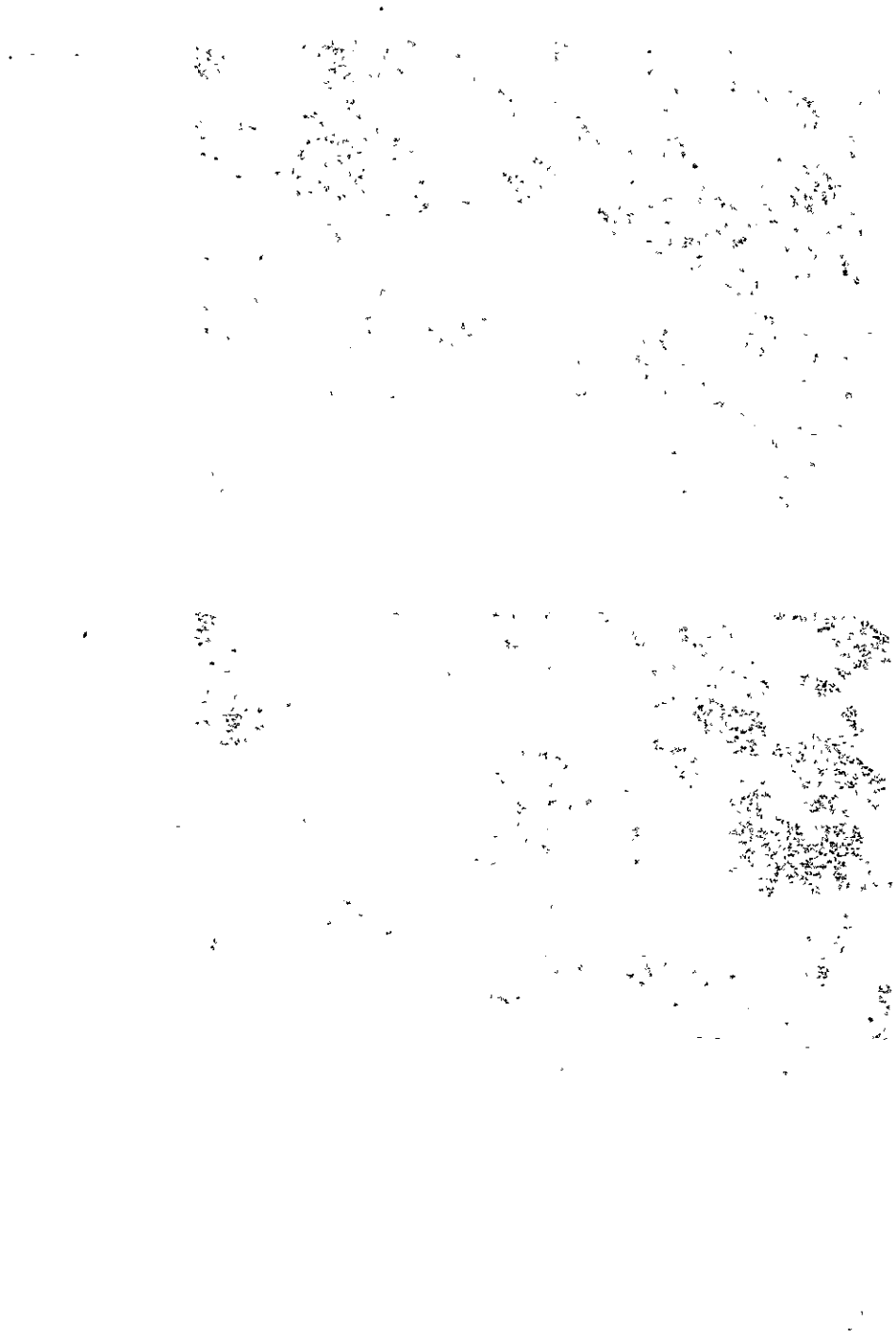
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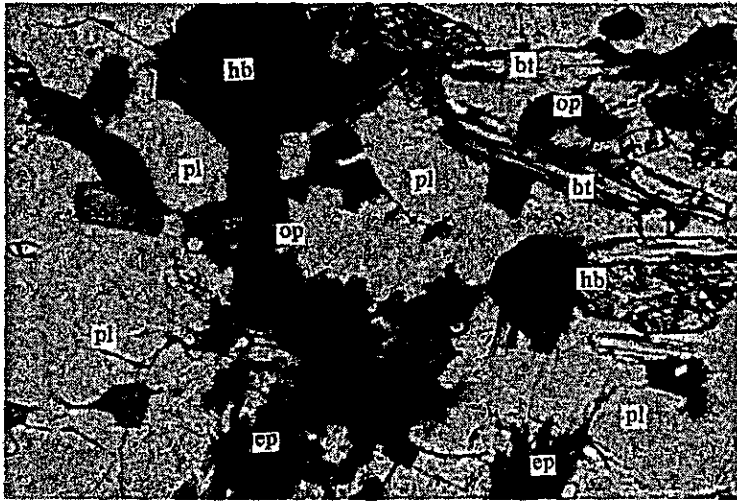


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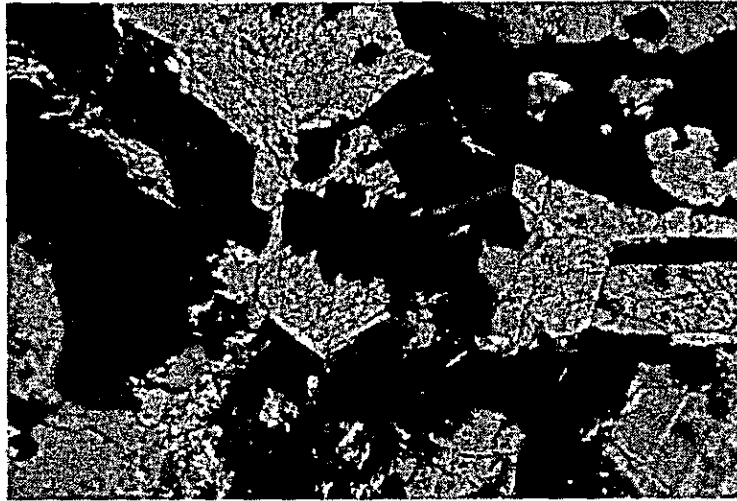
0 0.5 mm

- Sample No. : C-002
 Rock name : Epidote hornblende gneiss, Juffa Gneiss.
 Location : Wadi Ain
 Observation : The rock is composed of hornblende, plagioclase, epidote, quartz, sphene and garnet showing gneissose texture.
 Hornblende : 0.1 to 1.0 mm, euhedral, pale green to bluish green colours.
 Plagioclase : 0.1 to 0.4 mm, anhedral, sometimes altered to sericite in a vermicular form.
 Epidote : 0.05 to 0.3 mm, euhedral.
 Quartz : Maximum 0.8 mm, anhedral.
 Sphene : Maximum 0.15 mm, euhedral.
 Garnet : 0.1 mm, euhedral.





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Crossed polars

0 0.5 mm

- Sample No. : A-021
 Rock name : Biotite hornblende gneiss, Sakh Gneiss.
 Location : Wadi Shaat
 Observation : The rock is composed of hornblende, plagioclase, biotite and others showing gneissose texture
 Hornblende : 0.05 to 0.5 mm, euhedral to subhedral, pale green to green or bluish green.
 Plagioclase : 0.1 to 0.3 mm, anhedral to subhedral, altered to sericite and epidote.
 Biotite : 0.2 to 0.4 mm in length, partly or completely altered to chlorite or epidote.
 Others : abundant opaque minerals and very small amount of garnet and apatite.

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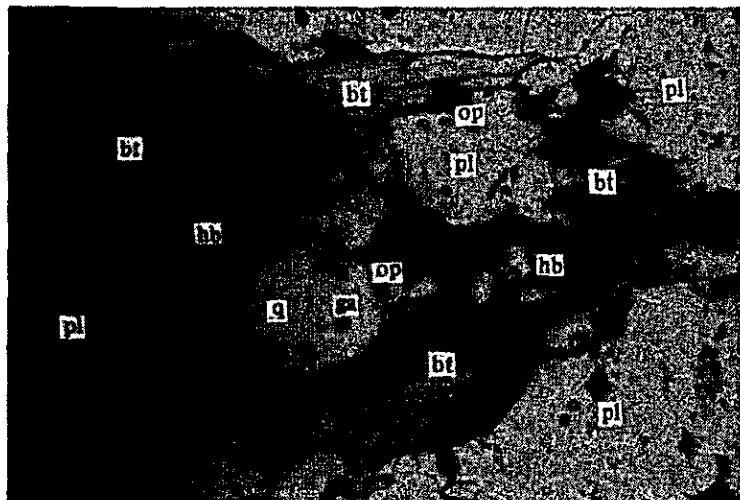
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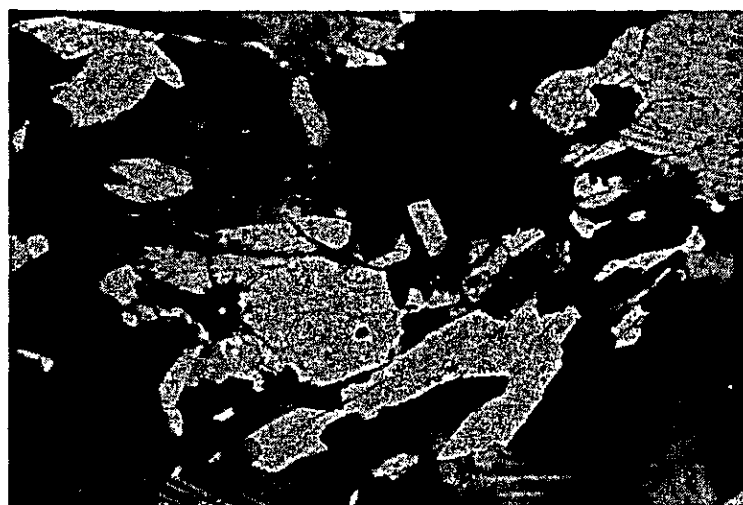
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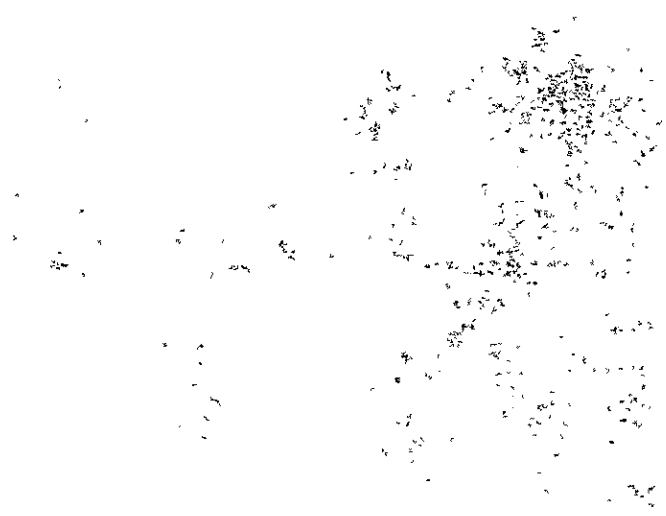
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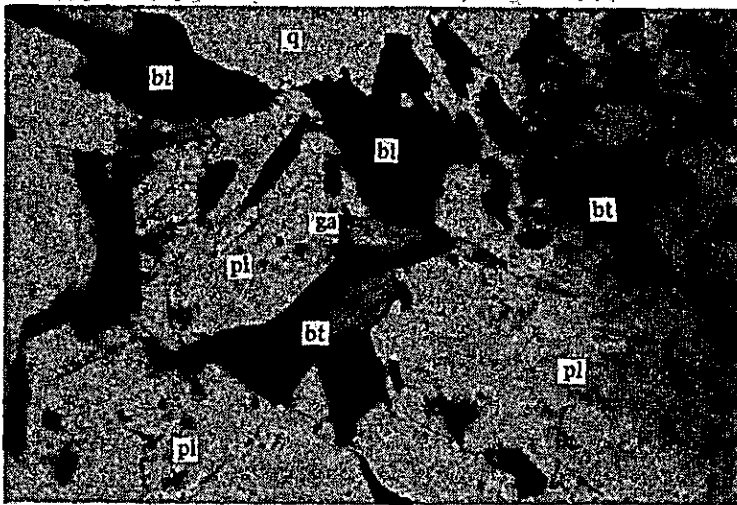


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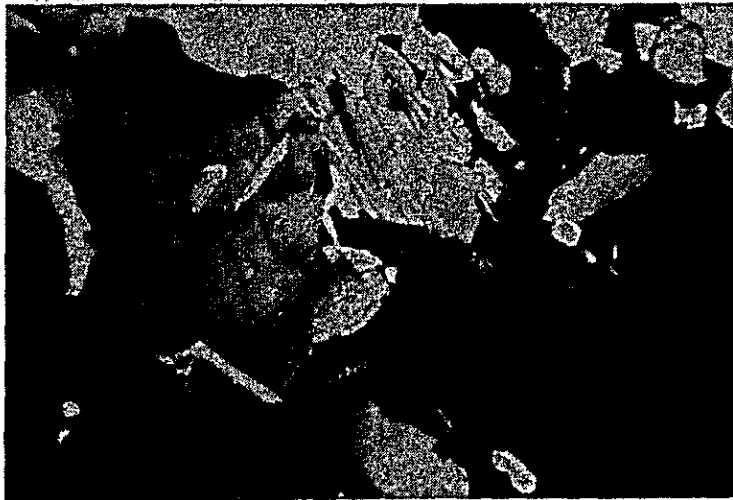
0 1 mm

- Sample No.** : C-055
Rock name : Hornblende biotite gneiss, Sadh Gneiss.
Location : Wadi Ain
Observation : The rock is composed of plagioclase, biotite, quartz, hornblende, garnet and others showing gneissose texture
 Plagioclase : 0.2 to 2.0 mm, anhedral, partly altered to sericite.
 Biotite : 0.2 to 0.8 mm in length, rarely includes garnet.
 Quartz : Maximum 0.8 mm, anhedral.
 Hornblende : 0.2 to 1.2 mm, euhedral to subhedral, pleochroism and cleavage are distinct.
 Garnet : 0.05 mm, hexagonal to rounded shape, mainly included in plagioclase.
 Others : Opaque minerals, apatite, epidote, sphene and calcite.





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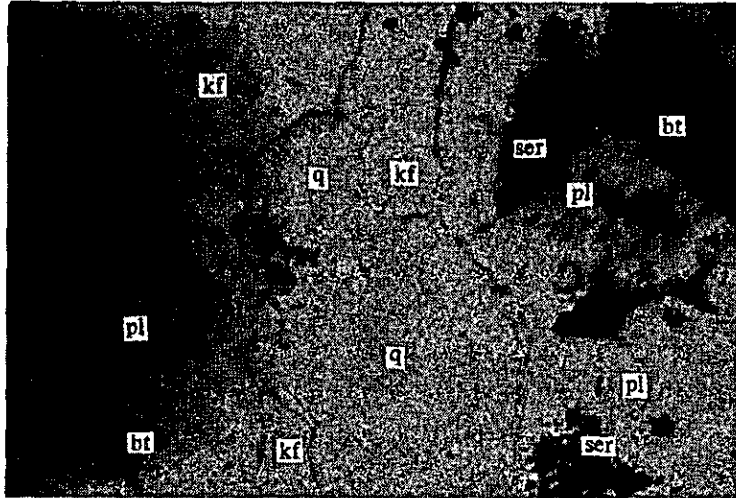
0 ————— 1 mm

- Sample No.** : B-071
Rock name : Biotite gneiss, Sadh Gneiss.
Location : 3 km east of Mirbat.
Observation : The rock is composed of quartz, plagioclase, biotite, K-feldspar, garnet and others showing gneissose texture.
 Quartz : Maximum 1.5 mm, anhedral.
 Plagioclase : 0.2 to 3.0 mm, anhedral to subhedral, partly altered to sericite.
 Biotite : Maximum 3.0 mm in length, euhedral to subhedral, rarely altered to chlorite in part.
 K-feldspar : 0.2 to 0.7 mm, anhedral.
 Garnet : 0.1 to 0.2 mm, euhedral to subhedral.
 Others : Sphene, epidote, apatite and opaque minerals.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to support effective decision-making.

3. The third part of the document focuses on the role of technology in modern data management. It discusses how advanced software solutions can streamline data collection, storage, and analysis, leading to more efficient and accurate results.



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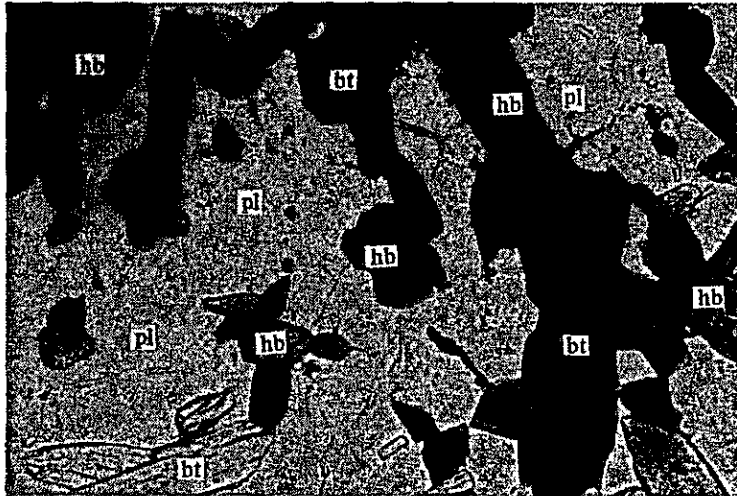


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- Sample No. : B-095
 Rock name : Granodiorite
 Location : 2 km west of Hadabin
 Observation : The rock is holocrystalline, equigranular and composed of quartz, plagioclase, K-feldspar, biotite and others.
 Quartz : 0.15 to 2.0 mm, anhedral.
 Plagioclase : 0.3 to 2.5 mm, euhedral to subhedral, showing zonal structure, partly altered to sericite and epidote.
 K-feldspar : 0.4 to 1.5 mm, microcline structure.
 Biotite : 0.2 to 0.8 mm in length, partly altered to chlorite and epidote.
 Others : Muscovite, garnet, sphene and opaque minerals.





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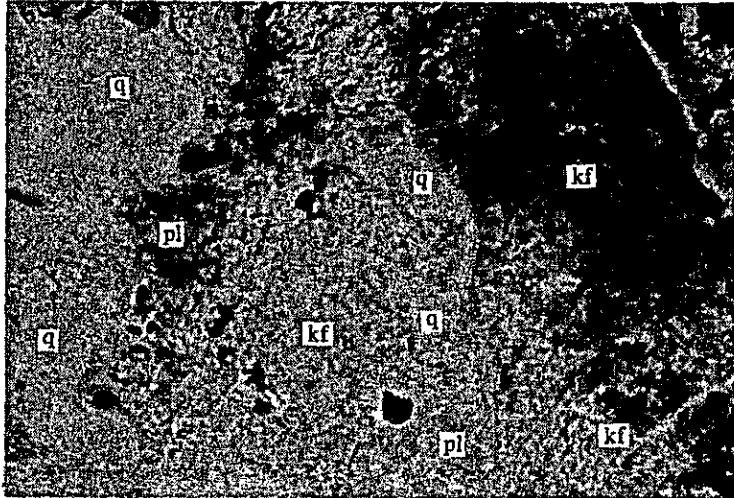
0 0.5 mm

- Sample No. : C-129
 Rock name : Quartz diorite
 Location : Wadi Fushi
 Observation : The rock is holocrystalline, equigranular and composed of plagioclase, quartz, biotite, hornblende and others.
 Plagioclase : 0.15 to 0.7 mm, euhedral to subhedral, displaying zonal structure, partly altered to sericite.
 Quartz : 0.1 to 0.4 mm, anhedral.
 Biotite : 0.1 to 0.8 mm, euhedral to subhedral.
 Hornblende : 0.05 to 0.8 mm, euhedral to subhedral, yellowish green to bluish green.
 Others : Garnet, sphene, epidote and opaque minerals.

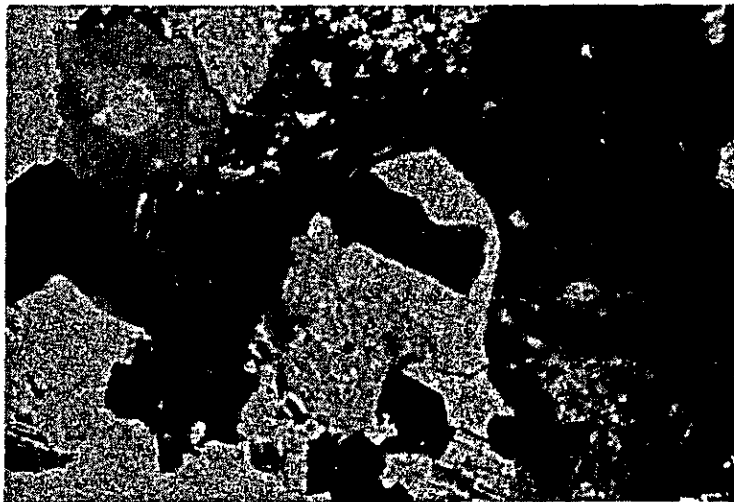
1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in financial reporting.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It highlights the importance of using reliable sources and ensuring the accuracy of the information gathered.

3. The third part of the document provides a detailed overview of the results of the study. It includes a summary of the key findings and a discussion of their implications for the field of research.



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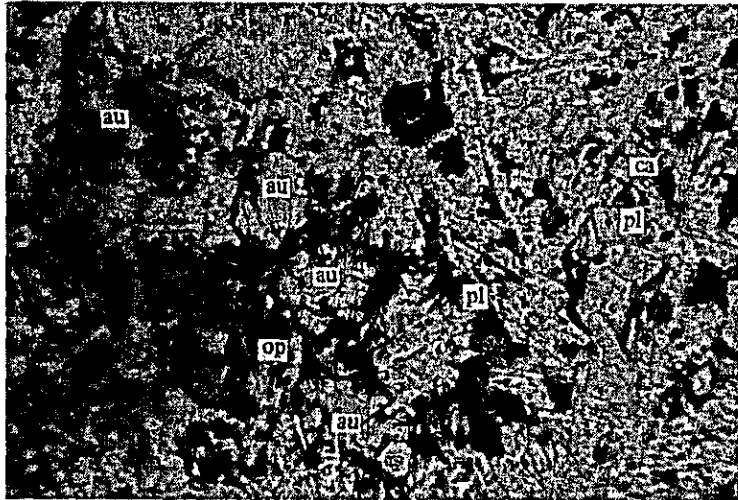


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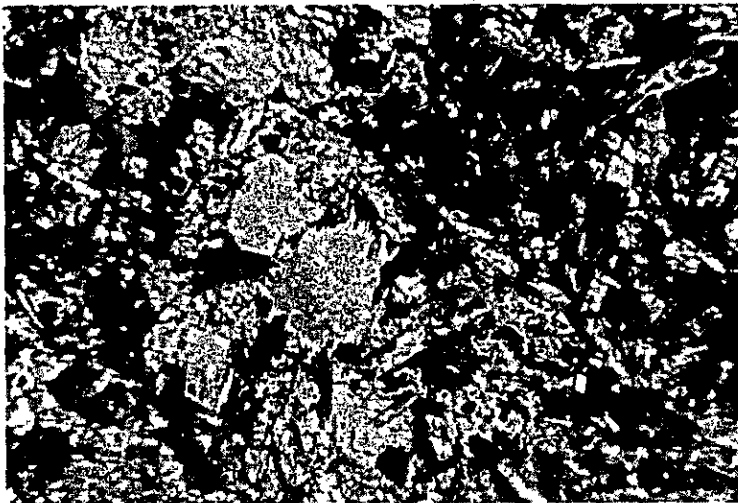
0 1 mm

- Sample No. : B-028
 Rock name : Quartz monzonite
 Location : Wadi Arzaq
 Observation : The rock is holocrystalline, equigranular and composed of quartz, K-feldspar, plagioclase, muscovite, biotite and secondary minerals.
 Quartz : 0.2 to 1.7 mm, subhedral to anhedral.
 K-feldspar : Maximum 4.0 mm, subhedral to anhedral, showing perthitic structure, partly altered to Sericite.
 Plagioclase : 0.3 to 2.5 mm, euhedral to subhedral, showing zonal structure, altered to sericite in a vermicular form.
 Muscovite : 0.1 to 0.4 mm, euhedral to subhedral.
 Biotite : 0.15 to 0.25 mm, completely altered to chlorite, epidote and opaque minerals.





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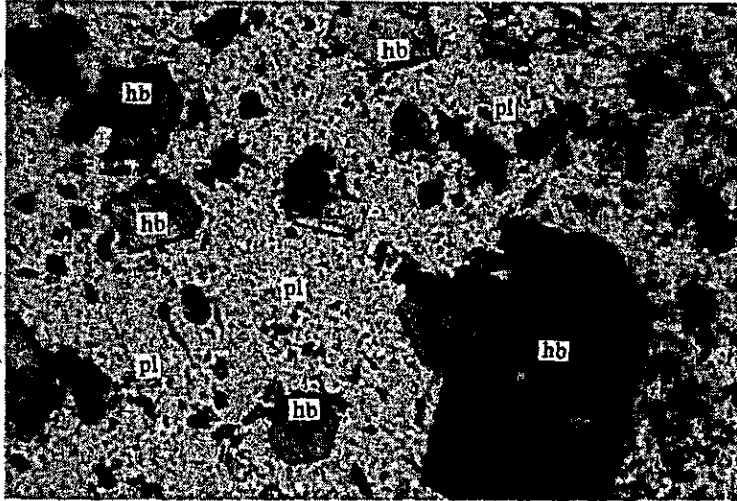


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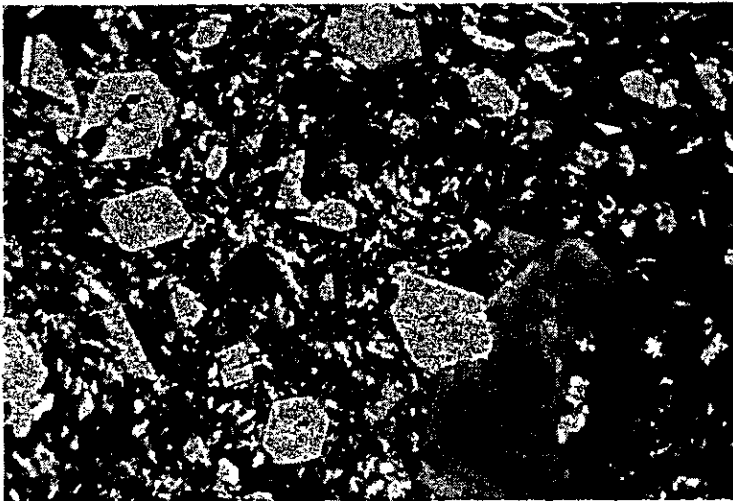
0 ————— 1 mm

- Sample No. : D-071
 Rock name : Dolerite
 Location : Wadi Khorhant
 Observation : The rock is holocrystalline, porphyritic and composed of augite, plagioclase and others showing ophitic texture.
 Augite : 0.1 to 0.75 mm, euhedral to subhedral.
 Plagioclase : 0.2 to 0.6 mm, euhedral to subhedral, strongly altered to sericite, calcite and chlorite.
 Others : Spene and opaque minerals.





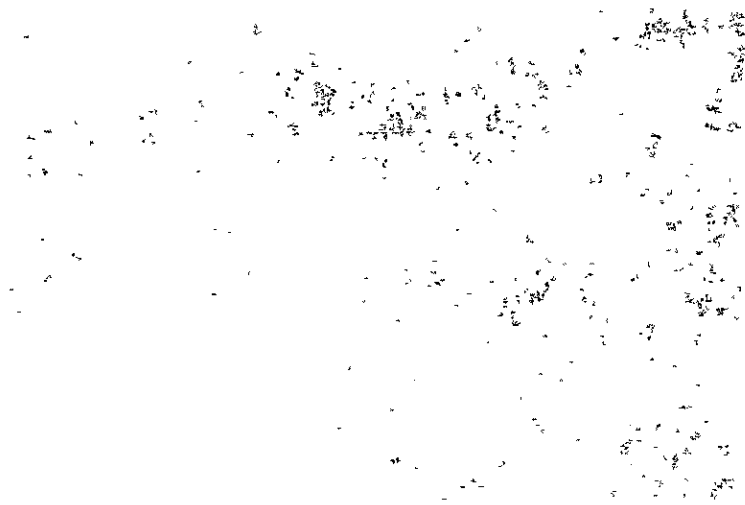
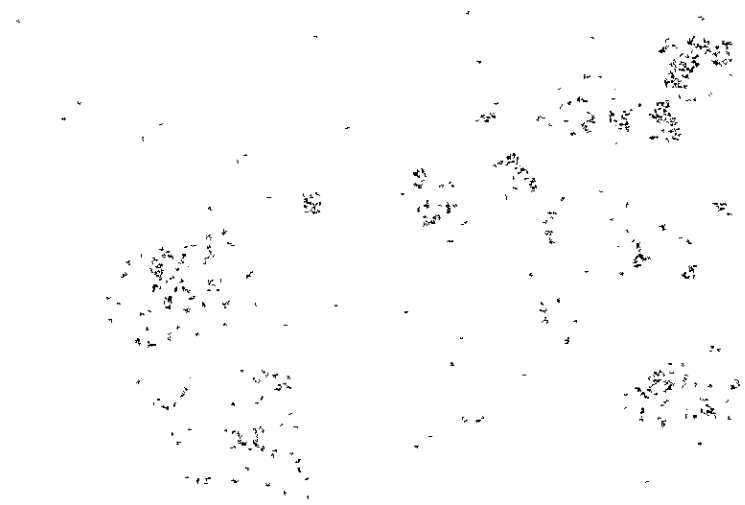
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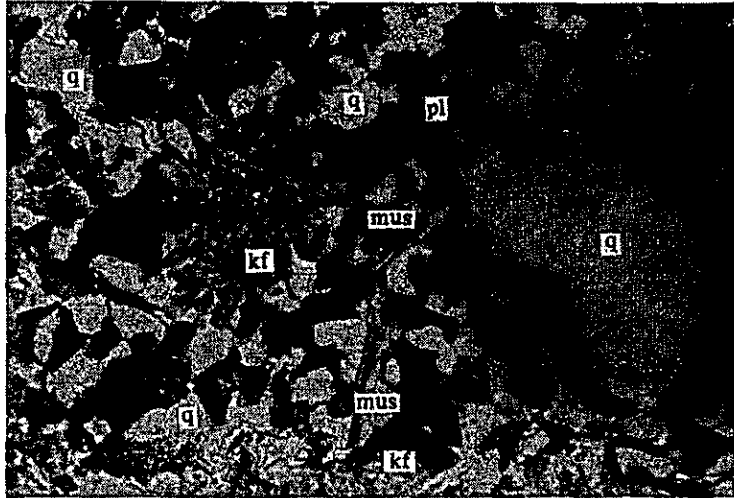


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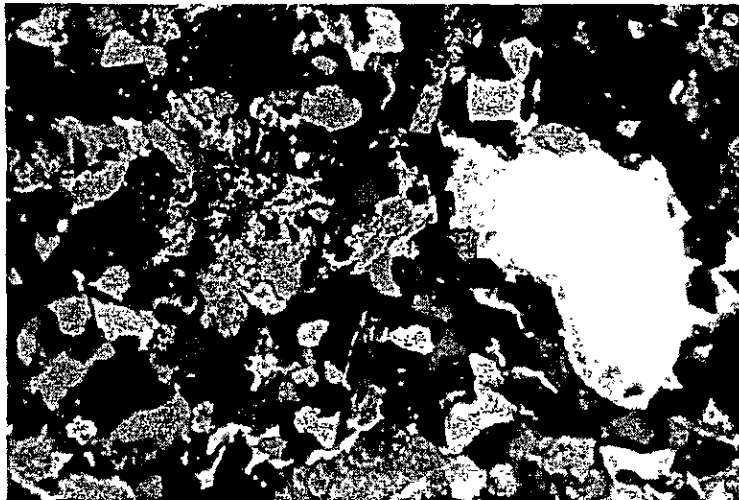
0 1 mm

Sample No. : B-105
 Rock name : Andesite
 Location : Wadi Marir
 Observation : The rock shows pilotaxitic texture. Phenocryst is composed of hornblende (0.1 to 0.25 mm), plagioclase (0.1 to 3.3 mm) and opaque minerals (0.05 to 0.2 mm). Groundmass consists of lathlike plagioclase, needle-like hornblende and opaque minerals. Hornblende is partly altered to chlorite.





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0 0.5 mm

Sample No. : A-020
Rock name : Quartz porphyry
Location : Wadi Khorhant
Observation : The rock is holocrystalline, porphyritic and partly shows micrographic texture. Phenocryst is composed of quartz (0.2 to 1.6 mm), K-feldspar (0.2 to 1.0 mm), plagioclase (0.2 to 0.8 mm) and muscovite (0.1 to 0.3 mm). Groundmass consists of quartz, K-feldspar, muscovite and plagioclase. Sericitization is observed.

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Fig. A-2 Microphotography of Polished Section

Abbreviations

il : ilmenite

hem : hematite

cp : chalcopyrite

py : pyrite

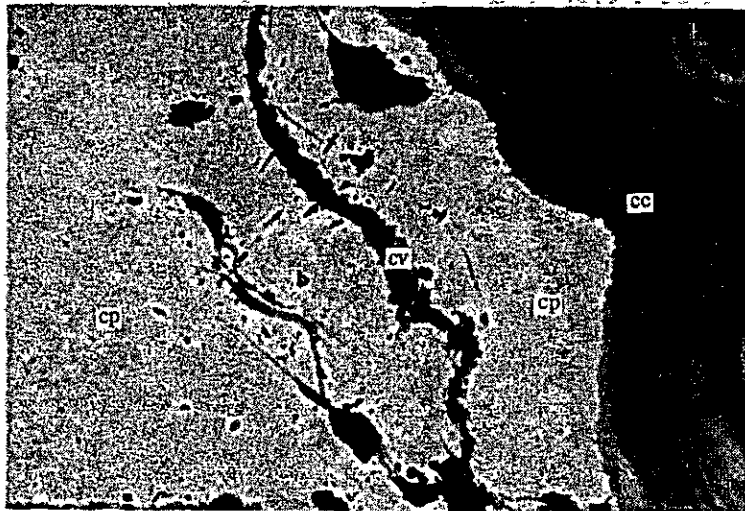
cv : covellite

cc : chalcocite

gal : galena

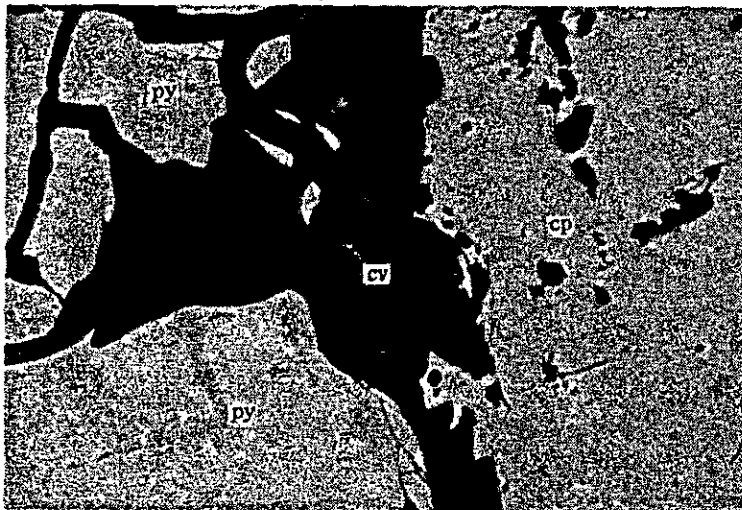
dim 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



Reflected light
Only lower polar

Sample No. : B-116
 Rock name : Copper ore.
 Location : Wadi Shiliyam.
 Observation : Spots of chalcopyrite with covellite and chalcocite as secondary oxidized minerals.



Reflected light
Only lower polar

Sample No. : B-120
 Rock name : Copper ore.
 Location : Wadi Shiliyam.
 Observation : Spots of chalcopyrite and pyrite with covellite as secondary oxidized minerals.

1000

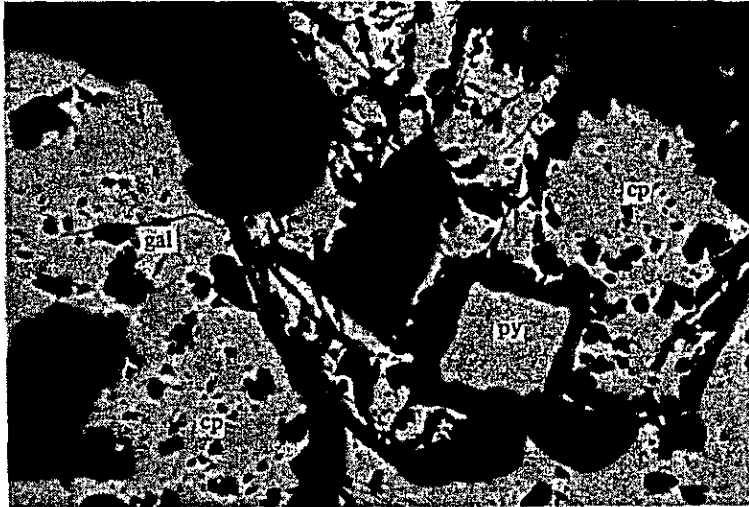
1000

1000

1000

1000

1000



Reflected light
Only lower polar

0 0.5 mm

Sample No. : B-019
Rock name : Copper ore.
Location : Wadi Shillyarn.
Observation : Spots of chalcopyrite containing small crystals of pyrite and galena.



Reflected light
Only lower polar

0 0.5 mm

Sample No. : C-112
Rock name : Lead ore
Location : Wadi Autant
Observation : Small spots of galena in barite.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent data collection procedures and the use of advanced analytical techniques to derive meaningful insights from the data.

3. The third part of the document focuses on the role of technology in data management and analysis. It discusses how modern software solutions can streamline data collection, storage, and analysis processes, thereby improving efficiency and accuracy.

4. The fourth part of the document addresses the challenges associated with data management, such as data quality, security, and privacy. It provides strategies to mitigate these risks and ensure that the data remains reliable and secure throughout its lifecycle.

5. The fifth part of the document concludes by summarizing the key findings and recommendations. It stresses the importance of ongoing monitoring and evaluation to ensure that the data management processes remain effective and aligned with the organization's goals.

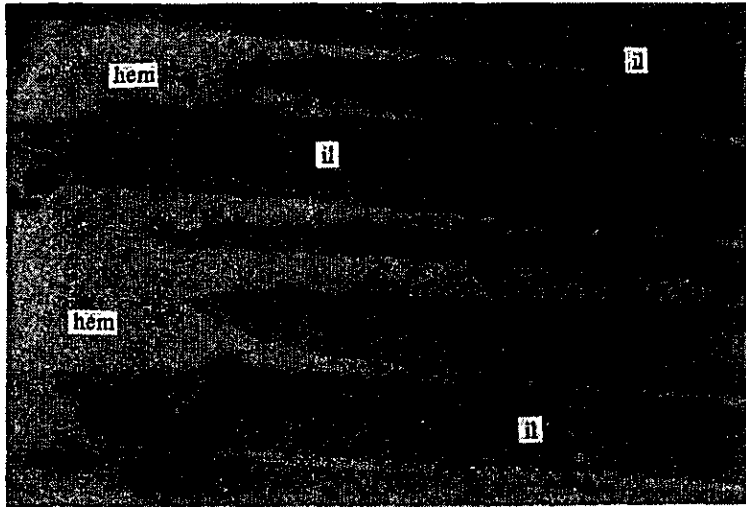
6. The sixth part of the document provides a detailed overview of the data management framework. It describes the various components of the framework, including data sources, data integration, data storage, and data access, and explains how they work together to support the organization's data needs.

7. The seventh part of the document discusses the importance of data governance and the role of the data governance committee. It outlines the committee's responsibilities, including defining data policies, standards, and procedures, and ensuring that these are consistently followed across the organization.

8. The eighth part of the document focuses on the role of data in decision-making. It discusses how data can be used to identify trends, opportunities, and risks, and how it can be used to inform strategic decisions and improve organizational performance.

9. The ninth part of the document provides a detailed overview of the data management process. It describes the various steps involved in the process, from data collection and storage to data analysis and reporting, and explains how these steps are integrated into the organization's overall data management strategy.

10. The tenth part of the document concludes by summarizing the key findings and recommendations. It stresses the importance of ongoing monitoring and evaluation to ensure that the data management processes remain effective and aligned with the organization's goals.



Reflected light
Only lower polar

0 0.5 mm

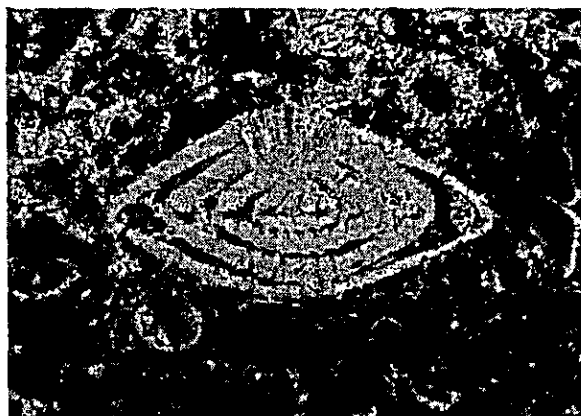
Sample No. : A-017
Rock name : Titanium ore
Location : 6 km NW of Juffa
Observation : Ilmenite and hematite show exsolution lamellae.

Fig. A-3 Microphotograph of Foraminifera

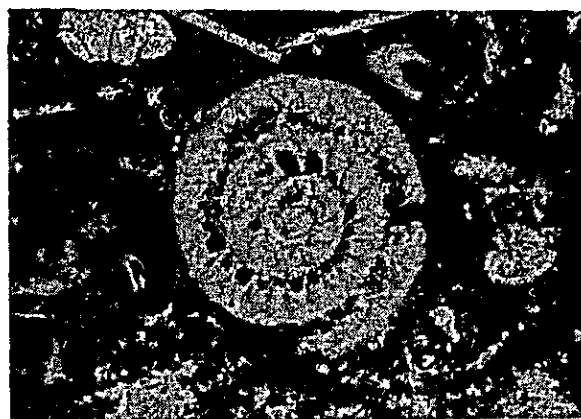
Nummulites globus Leymerie, 1846 (x 25.5)



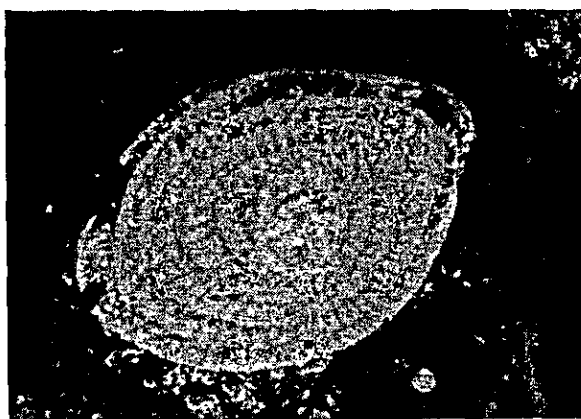
megalospheric form
(axial section)



megalospheric form
(oblique section)



megalospheric form
(equatorial section)



microspheric form
(oblique section)

Fig. A-4 Chart of X-ray Diffractive Analysis

Abbreviation

qz : quartz

ab : albite

mus : muscovite

chl : chlorite

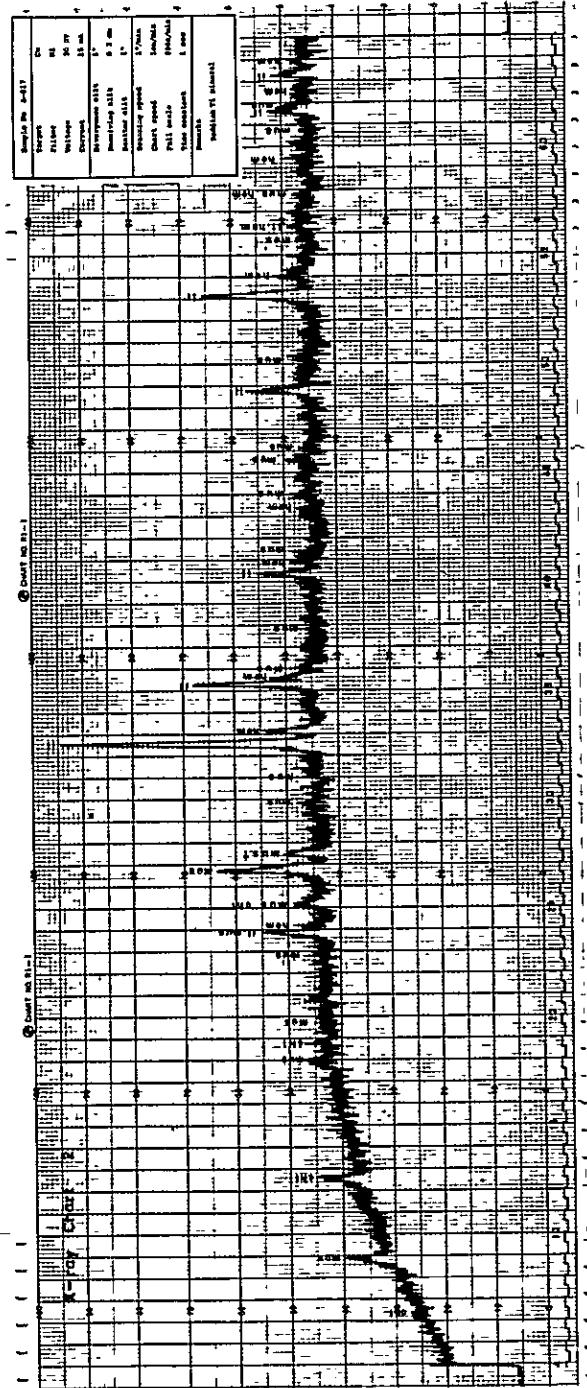
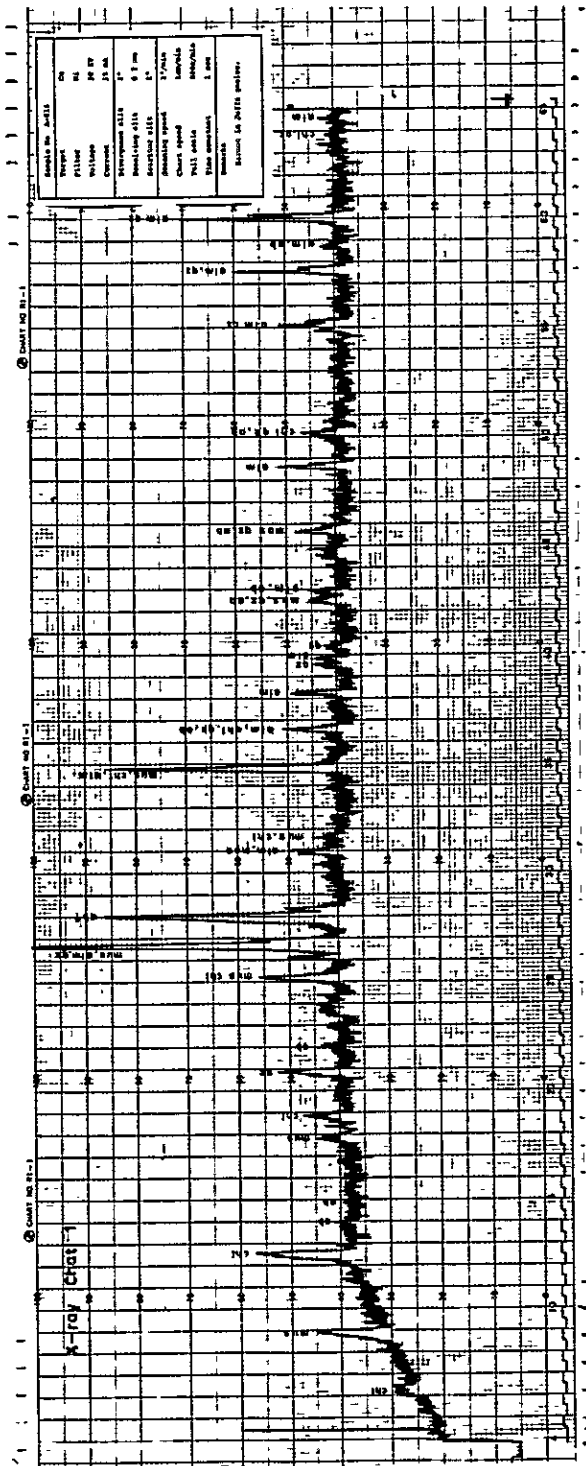
cal : calcite

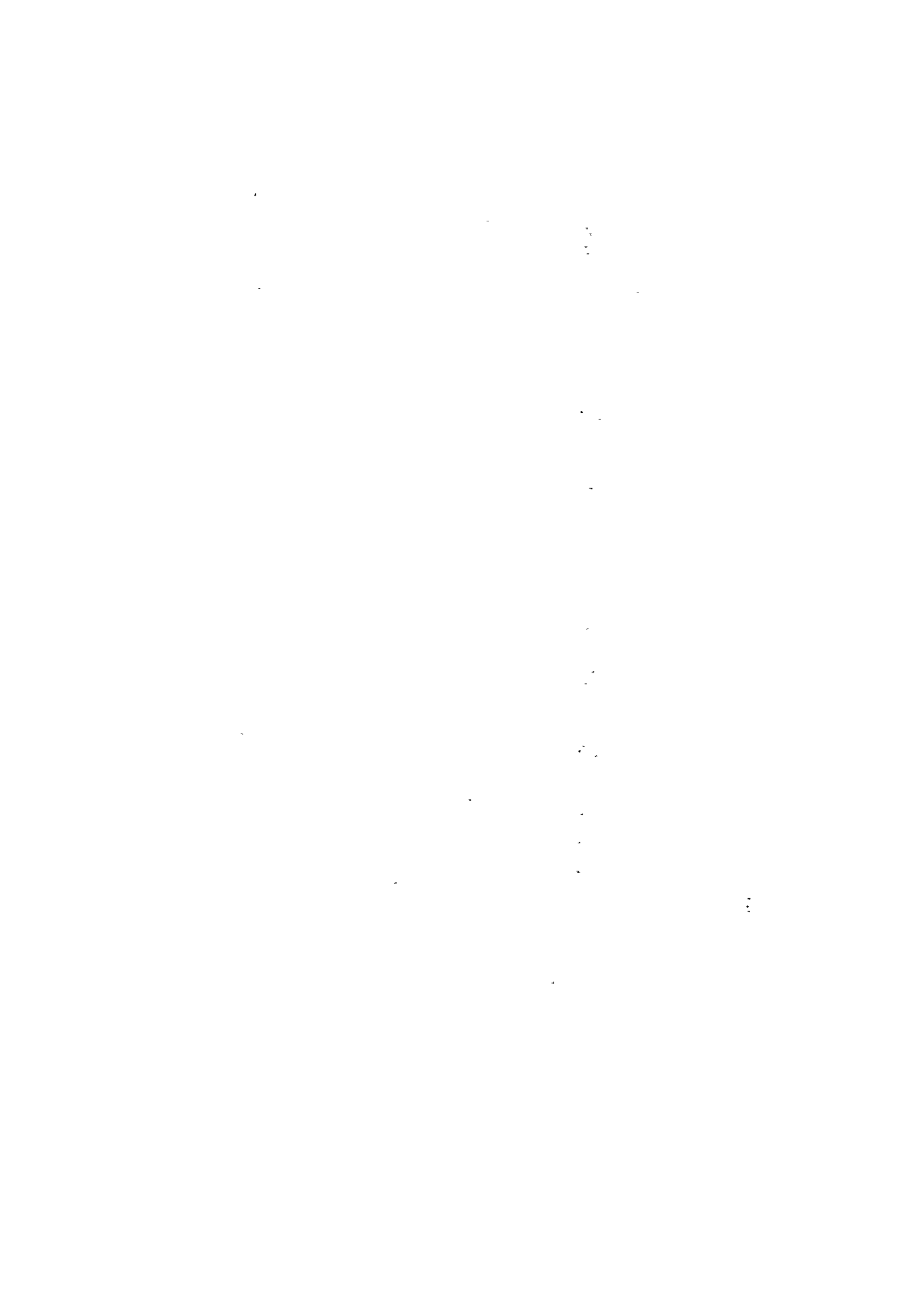
dol : dolomite

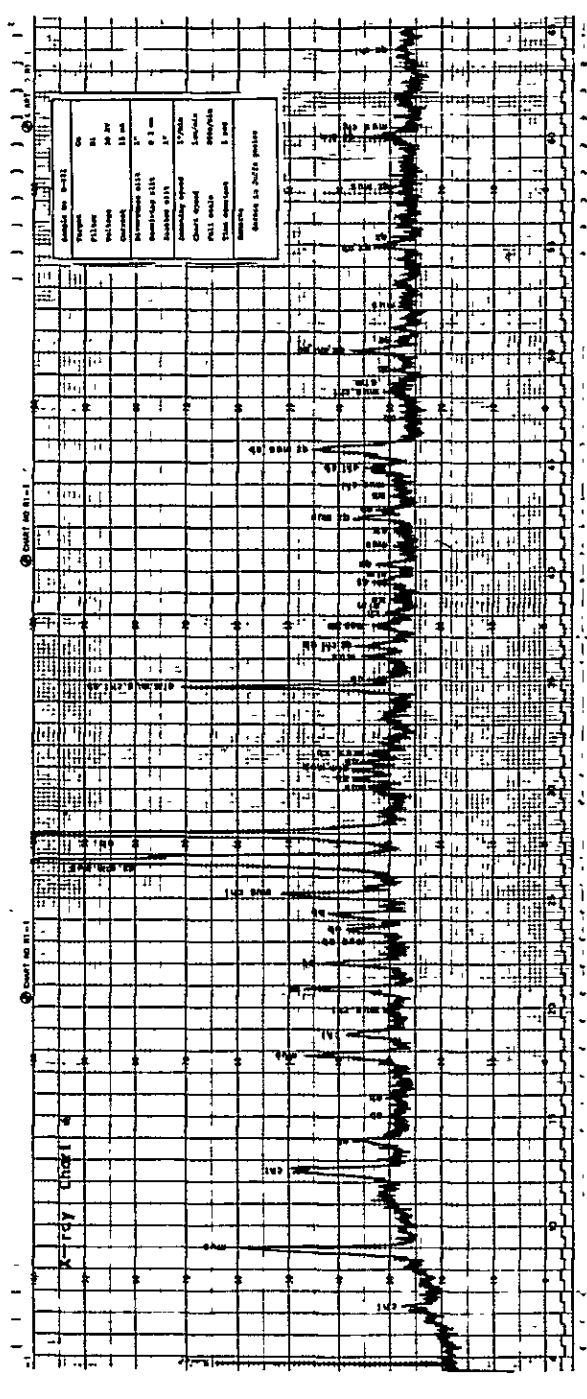
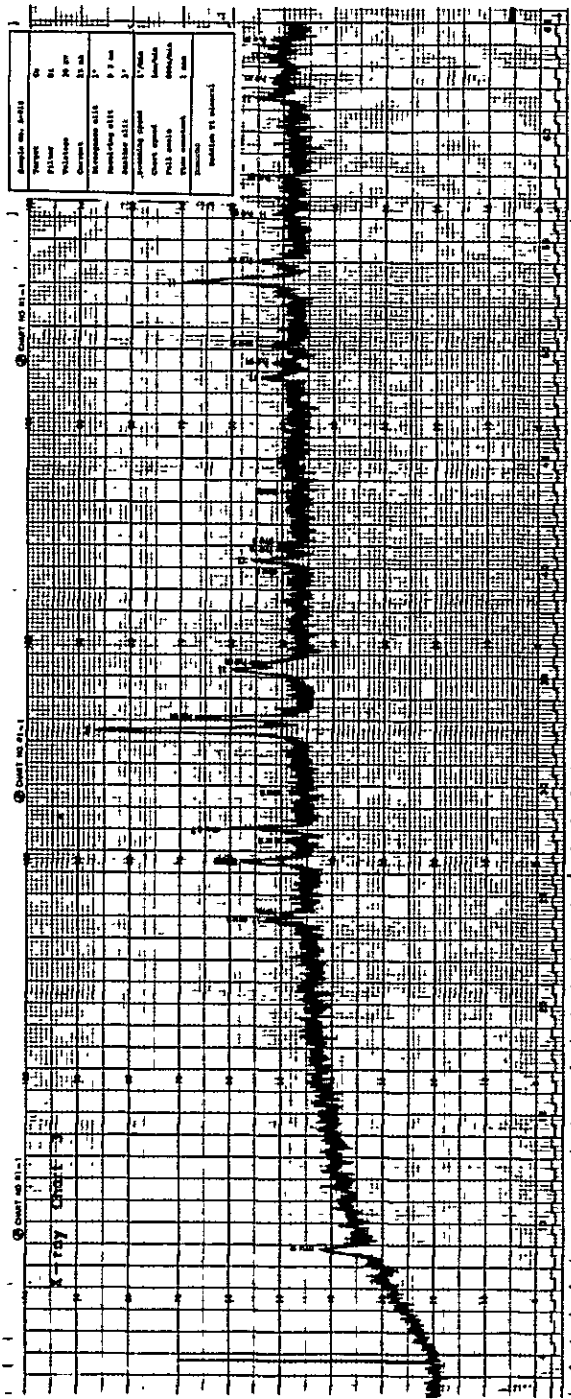
alm : almandine

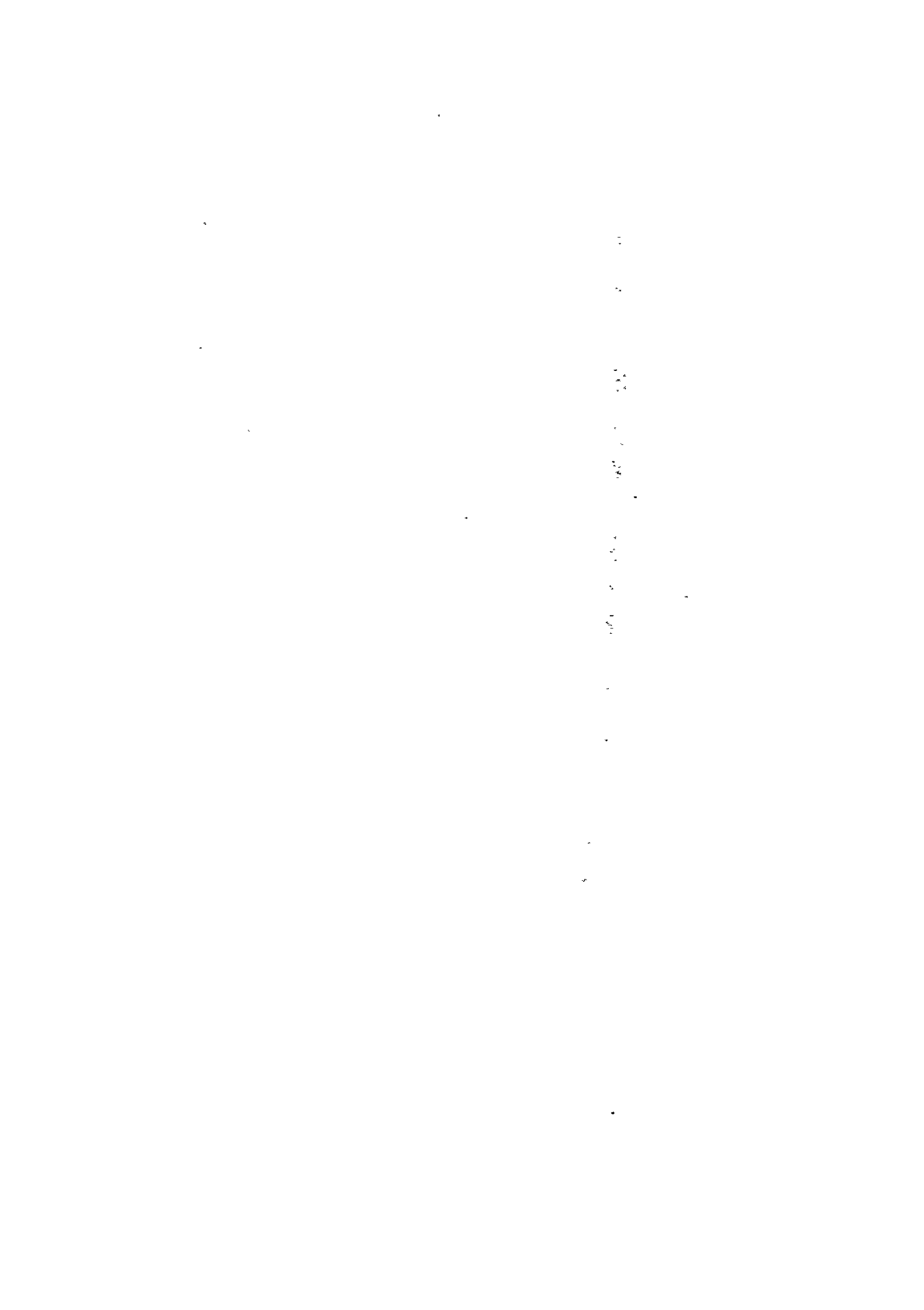
il : ilmenite

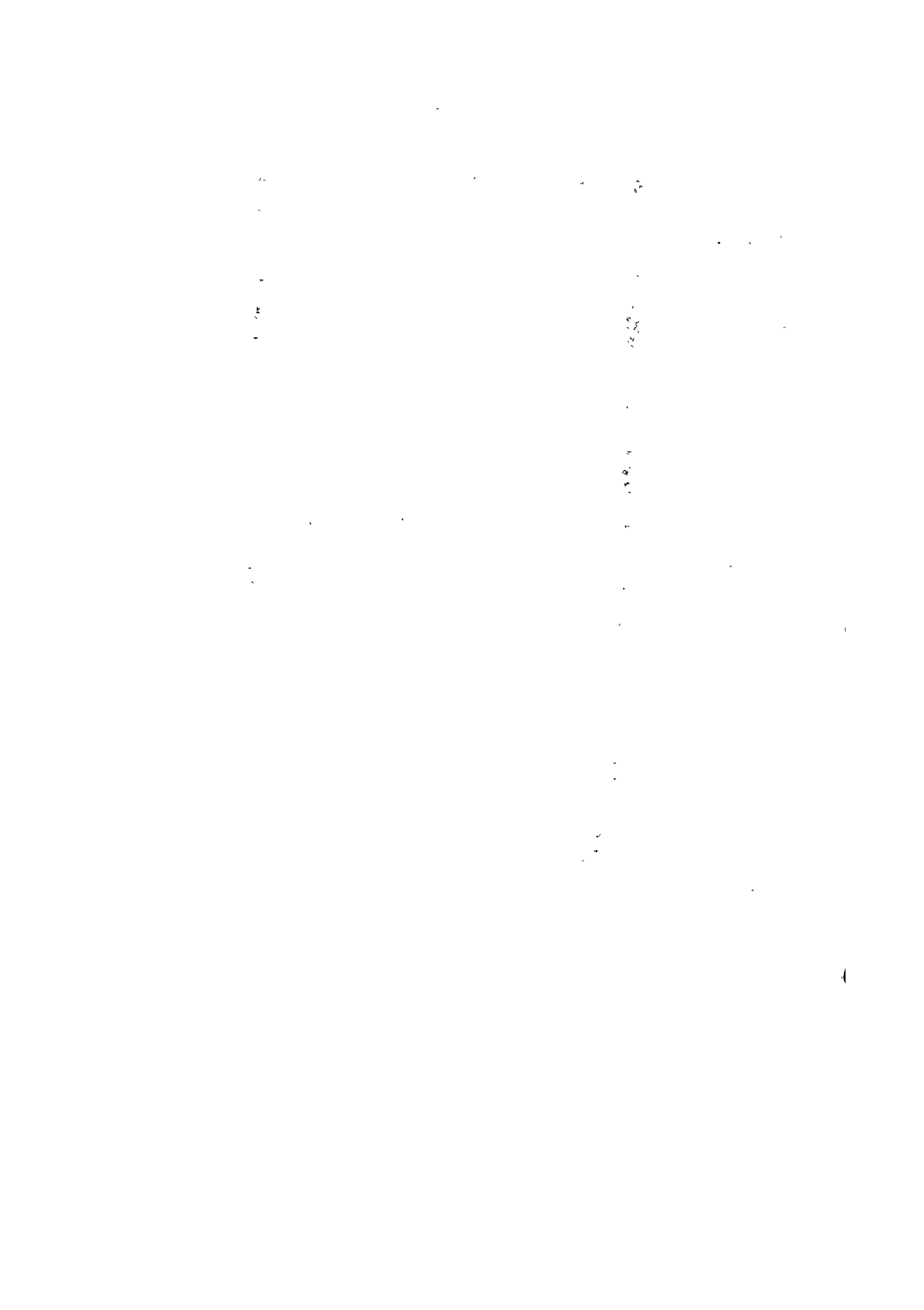
hem : hematite

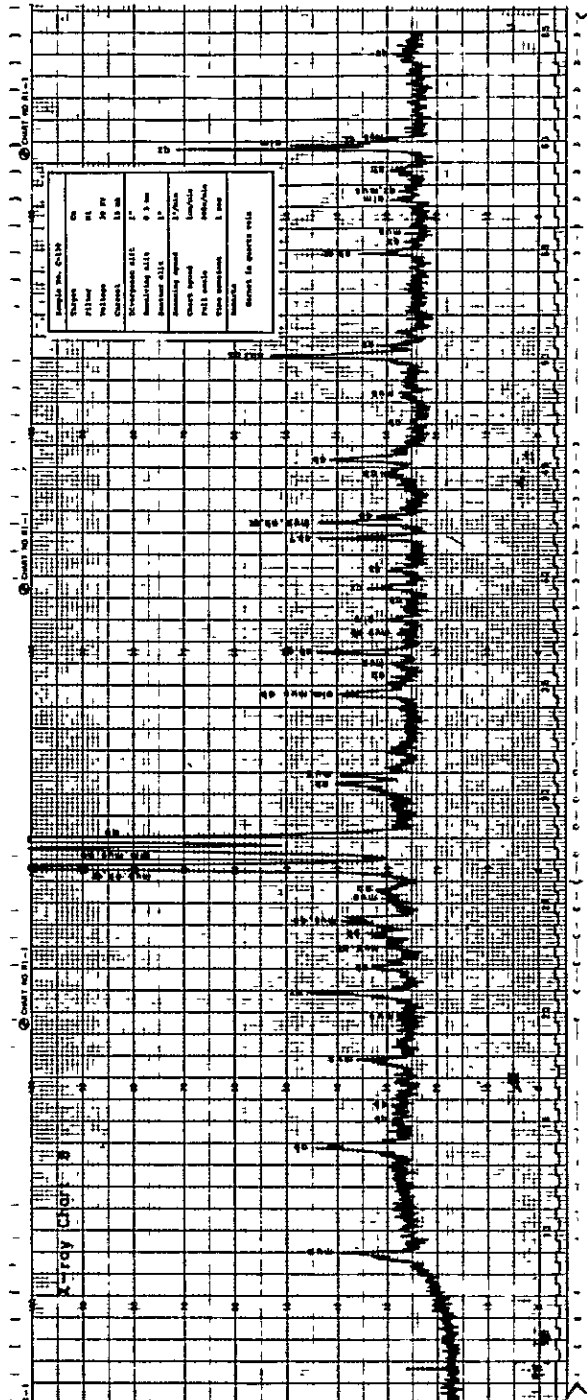
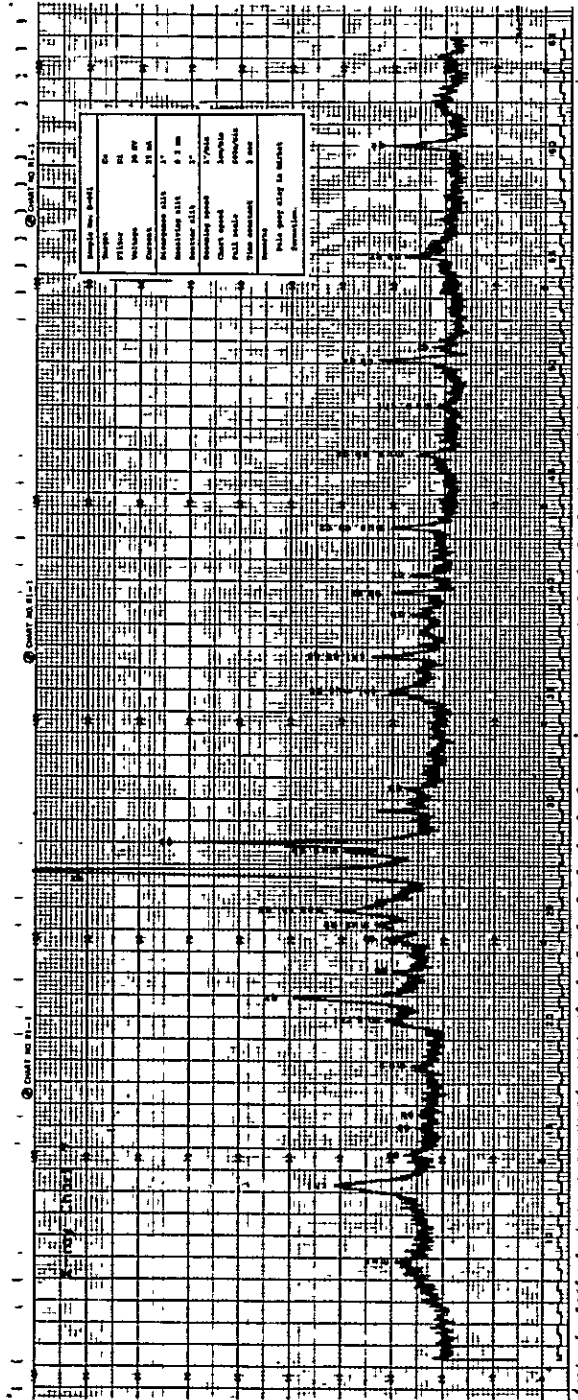


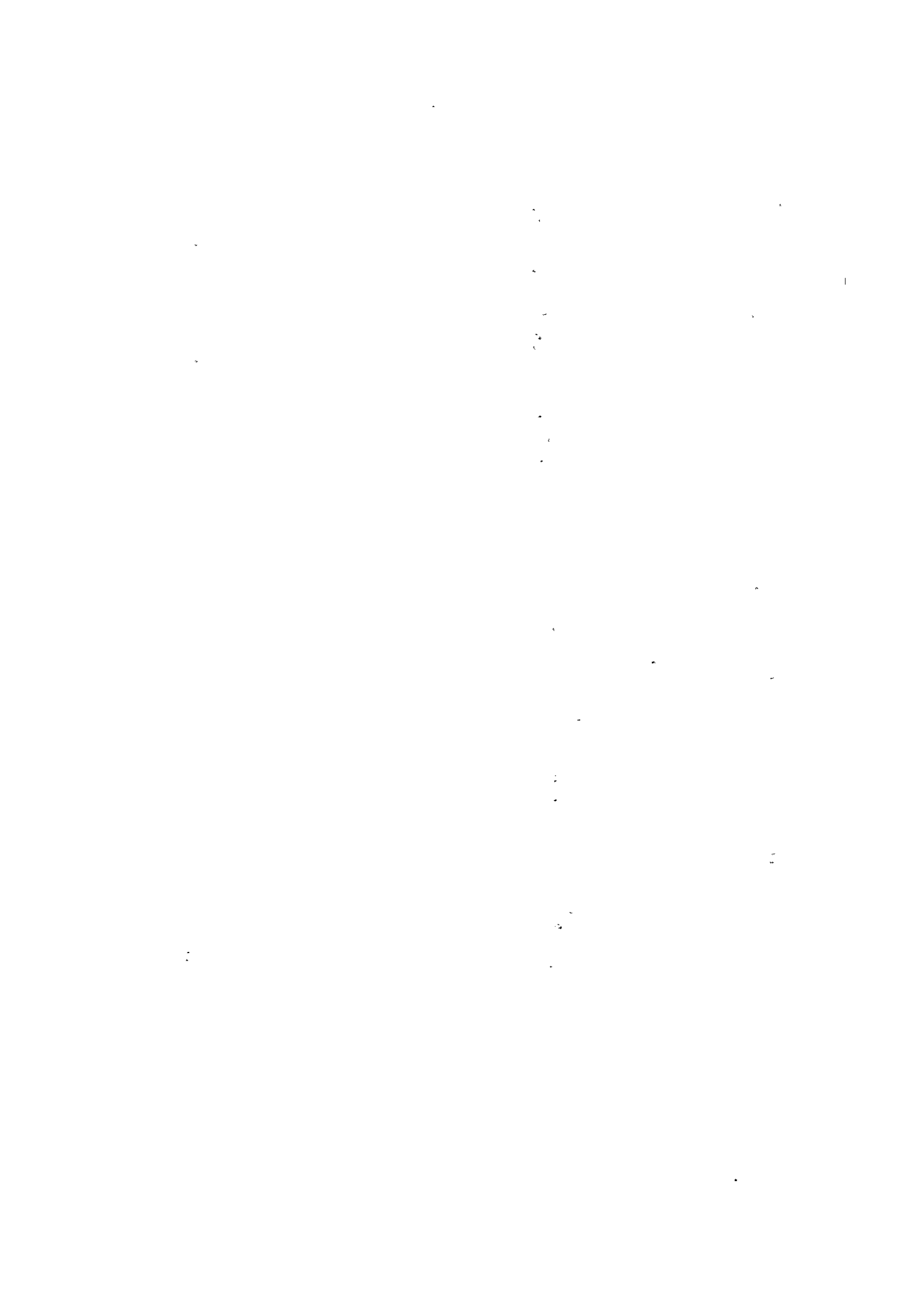












Handwritten text, possibly bleed-through from the reverse side of the page. The text is extremely faint and illegible due to low contrast and blurring. It appears to be organized into several vertical columns, possibly representing a list or a structured document. Some faint characters and symbols are visible, but they cannot be transcribed accurately.

Table A-1 Microscopic Observation of thin section

Abbreviation

q	: quartz
pl	: plagioclase
kf	: potash feldspar
bt	: biotite
mus	: muscovite
hb	: hornblende
au	: augite
ga	: garnet
op	: opaque mineral
ap	: apatite
sph	: sphene
ser	: sericite
chl	: chlorite
ep	: epidote
ca	: calcite

TABLE I
 SUMMARY OF THE EXPERIMENTAL RESULTS

Run	Time (min)	Yield (%)	Product
1	10	85	...
2	20	75	...
3	30	65	...
4	40	55	...
5	50	45	...
6	60	35	...
7	70	25	...
8	80	15	...
9	90	5	...
10	100	0	...

Group	Sample No.	Rock name	q	pl	kf	bt	mus	hb	au	ga	op	ap	sph	ser	chl	ep	ca	Remarks
Jufra Gneiss	A-001	mus bt gneiss	○	○	○	○												gneissose texture
	A-012	bt mus gneiss	○	○	○	○												ditto
	A-016	bt mus gneiss	○	○	○	○												ditto , most of bt is altered to chl
	B-043	mus bt gneiss	○	○	○	○												ditto , bt is altered to chl and ser
	B-051	bt gneiss	○	○	○	○												ditto , bt is altered to chl and ser
	C-001	bt mus gneiss	○	○	○	○												ditto
	C-010	bt mus gneiss	○	○	○	○												ditto
	C-037	mus bt gneiss	○	○	○	○												ditto
	C-041	mus gneiss	○	○	○	○												ditto , bt is altered to chl
	D-034	mus bt gneiss	○	○	○	○												ditto , most of bt is altered to chl
	D-035	mus bt gneiss	○	○	○	○												ditto , myrmekite texture
	B-036	ep hb gneiss	○	○	○	○												ditto
	B-046	ep hb gneiss	○	○	○	○												ditto
	C-002	ep hb gneiss	○	○	○	○												ditto
	C-023	ep hb gneiss	○	○	○	○												ditto
D-069	amphibolite	○	○	○	○												ditto	
D-072	ep hb gneiss	○	○	○	○												gneissose texture	
Saadi Gneiss	A-008	bt gneiss	○	○	○	○												ditto
	A-009	mus bt gneiss	○	○	○	○												ditto
	B-001	mus bt gneiss	○	○	○	○												ditto
	B-071	bt gneiss	○	○	○	○												ditto , myrmekite texture
	B-114	bt gneiss	○	○	○	○												ditto
	D-057	bt gneiss	○	○	○	○												ditto , equigranular
	D-063	bt gneiss	○	○	○	○												ditto , bt is altered to chl
	B-062	hb bt gneiss	○	○	○	○												ditto
	B-068	bt hb gneiss	○	○	○	○												ditto , bt is altered to chl
	B-103	hb bt gneiss	○	○	○	○												ditto , equigranular
	C-051	hb bt gneiss	○	○	○	○												ditto
	A-021	bt hb gneiss	○	○	○	○												ditto
	B-053	hb gneiss	○	○	○	○												ditto
	B-060	ep hb gneiss	○	○	○	○												ditto
	B-108	bt hb gneiss	○	○	○	○												ditto
B-111	bt hb gneiss	○	○	○	○												ditto , bt is altered to chl, pl is altered to ser	
C-045	ep hb gneiss	○	○	○	○												ditto	
D-058	ep amphibolite	○	○	○	○												poikiloblastic texture	
D-062	ep amphibolite	○	○	○	○												poikiloblastic texture	
D-065	ep amphibolite	○	○	○	○												ditto	
Intrusive rocks	B-090	q diorite	○	○	○	○												equigranular , pl is altered to ser, epidotized
	B-095	granodiorite	○	○	○	○												ditto , myrmekite texture
	B-113	granodiorite	○	○	○	○												ditto , coarse grained
	B-118	granodiorite porphyry	○	○	○	○												porphyritic texture
	C-118	granodiorite	○	○	○	○												equigranular
	C-129	q diorite	○	○	○	○												ditto , fine grained
	C-131	granodiorite	○	○	○	○												ditto
	C-204	granodiorite	○	○	○	○												ditto , myrmekite texture
	B-077	granodiorite	○	○	○	○												ditto , myrmekite texture, ca veinlets
	D-025	q monzonite	○	○	○	○												ditto , ca veinlets
	D-026	granodiorite	○	○	○	○												ditto , myrmekite texture, coarse grained
	B-028	q monzonite	○	○	○	○												ditto , kf shows perthite structure
	A-004	q porphyry	○	○	○	○												porphyritic texture, micrographic texture, chloritized
	A-010	rhyolite	○	○	○	○												microcryptocrystalline, spherulitic texture, sericitized
	A-014	rhyolite	○	○	○	○												spherulitic texture, sericitized and carbonatized
A-020	q porphyry	○	○	○	○												porphyritic texture, micrographic texture	
B-015	q porphyry	○	○	○	○												ditto , sericitized	
B-016	q porphyry	○	○	○	○												ditto , strongly sericitized	
B-102	rhyolite	○	○	○	○												spherulitic texture chloritized	
D-051	q porphyry	○	○	○	○												porphyritic texture, micrographic texture, chloritized	
D-073	q porphyry	○	○	○	○												porphyritic texture, micrographic texture	
A-005	q dolerite	○	○	○	○												subophitic texture, chloritized	
A-013	diorite porphyry	○	○	○	○												porphyritic texture, strongly chloritized and carbonatized	
B-105	andesite	○	○	○	○												plagioclase texture	
B-115	diorite porphyry	○	○	○	○												porphyritic texture, ca veinlets	
D-071	dolerite	○	○	○	○												ophitic texture	
C-047	aplite	○	○	○	○												equigranular, ca veinlets	
D-045	pegmatite	○	○	○	○												ditto , very coarse grained	

⊗ abundant ○ : common * rare () pseudomorph

Table A-2 Microscopic Observation of Polished Section

Sample No.	Location	Ore minerals								Remarks
		Il	Hem	Cp	Py	Cv	Cc	Gal		
A-017	Main road (near Juffa)	⊙	○							showing exsolution lamellae
B-019	Wadi Shiliyam			⊙	•	•			•	Py and Gal are enclosed in Cp
B-116	Wadi Shiliyam			⊙		⊙	○			strongly oxidized
B-120	Wadi Shiliyam			⊙	⊙	○				strongly oxidized
C-112	Wadi Autant								⊙	small spots in Barite vein
D-033	Wadi Bayt Said				⊙					limonitized

Abbreviation Il : Ilmenite, Hem : Hematite, Cp : Chalcopyrite, Py : Pyrite, Cv : Covellite, Cc : Chalcocite, Gal : Galena

⊙ : abundant, ○ : common, • : rare

Table A-3 List of Foraminifera

Formation	Sample No.	Location	Umm er Radhuma F.	Mirbat Sandstone Formation							
Foraminifera	Lager foraminifera	Nummulites globulus Leymerie, 1846	○	Jabal Nuss	Wadi Ain	C-016	○				
					Wadi Hinum	C-118	○				
					Wadi Hinum	C-119	○				
					Wadi Ercahol	D-004	○				
Benthonic foraminifera	Alveolinidae	○		Wadi Ercahol	D-008	○					
				Wadi Ercahol	D-011	○					
				Wadi Ercahol	D-013	○					
				Wadi Ercahol	D-021	○					
Non foraminifera	Cyclamininae	○		Wadi Ercahol	D-028	○					
				Wadi Ercahol	D-054	○					
				Wadi Ercahol	D-100	○					
Non foraminifera	Soritinae	○		Wadi Ercahol	D-008	○					
				Wadi Ercahol	D-011	○					
				Wadi Ercahol	D-013	○					

Year	Month	Day	Time	Location	Remarks
1950	1	1	08:00	...	...
1950	1	2	08:00	...	...
1950	1	3	08:00	...	...
1950	1	4	08:00	...	...
1950	1	5	08:00	...	...
1950	1	6	08:00	...	...
1950	1	7	08:00	...	...
1950	1	8	08:00	...	...
1950	1	9	08:00	...	...
1950	1	10	08:00	...	...
1950	1	11	08:00	...	...
1950	1	12	08:00	...	...
1950	1	13	08:00	...	...
1950	1	14	08:00	...	...
1950	1	15	08:00	...	...
1950	1	16	08:00	...	...
1950	1	17	08:00	...	...
1950	1	18	08:00	...	...
1950	1	19	08:00	...	...
1950	1	20	08:00	...	...
1950	1	21	08:00	...	...
1950	1	22	08:00	...	...
1950	1	23	08:00	...	...
1950	1	24	08:00	...	...
1950	1	25	08:00	...	...
1950	1	26	08:00	...	...
1950	1	27	08:00	...	...
1950	1	28	08:00	...	...
1950	1	29	08:00	...	...
1950	1	30	08:00	...	...
1950	1	31	08:00	...	...

ADMITTED TO THE ...

Table A-4 List of X-ray Diffractive Analysis

Sample No.	qz	ab	mus	chl	ser	alm	il	hem	cal	dol	Remarks
A-106	⊙	⊙	○	○		○					Garnet in Juffa Gneiss.
A-017			•	•			⊙	○			Ti mineral in Juffa Gneiss
A-019			•				⊙	○			Ti mineral in Sada Gneiss
B-021	⊙	⊙	○	•		•					Garnet in Juffa Gneiss
B-052 (a)			•	•		⊙					Garnet in Juffa Gneiss
B-052 (b)						⊙					Garnet in Juffa Gneiss
B-081	⊙	○	○	○	• ?						Pale gray clay in Mirbat Sandstone Formation
C-138	○	⊙	○			•					Garnet in pegmatite vein
D-004									⊙	•	Stinkstone
D-020	○	○	•	•		⊙					Garnet in Sadh Gneiss

Abbreviation

qz : quartz, ab : albite, mus : muscovite, chl : chlorite, ser : sericite alm : almandine, il : ilmenite, hem : hematite, cal : calcite, dol : dolomite

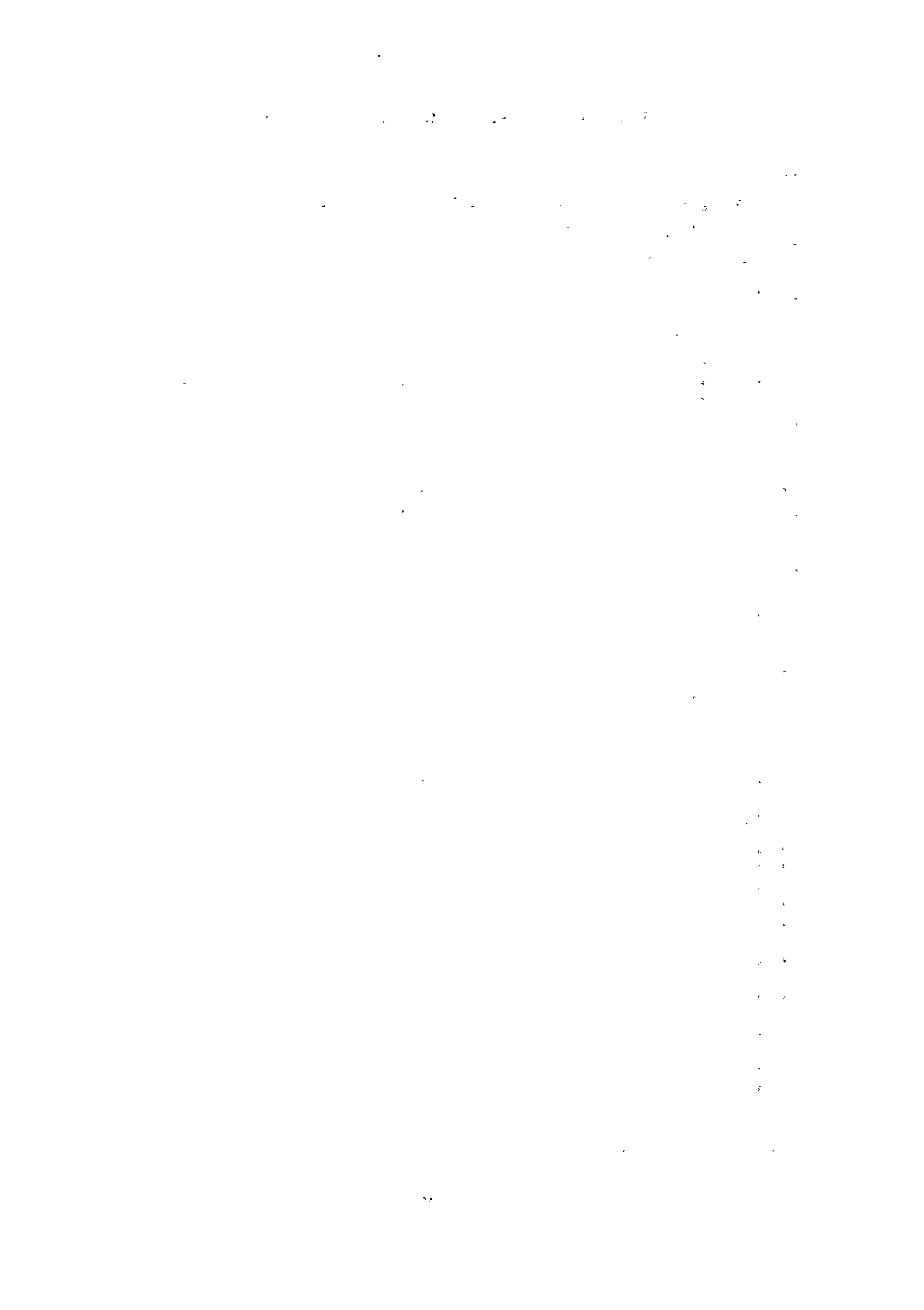
⊙ : abundant ○ : common • : rare

1847

Table A - 5 Result of Radioactive Measurement (1)

	Upper member		Middle member					Lower member					Basement	
	ss	siltstone shale	cg	v.c. ss	c. ss	m-f. ss	siltstone shale	ls	cg	v.c. ss	c. ss	m-f. ss		siltstone shale
1-1				a										
1-2					5									
1-3							10							
1-4							9							
1-5							10							
1-6					5		8							
1-7					5									
1-8		6												
1-9		6												
1-10		6												
1-11		8												
1-12		11												
1-13	7													
2-1								2						
2-2							9							
2-3							11							
2-4			7											
2-5				7										
2-6							14							
2-7						15								
2-8						10								
2-9					5									
2-10						9								
2-11							15							
2-12		11												
2-13						12	12							
2-14							12							
2-15							15							
2-16		15												
3-1				4						5				
3-2									5					
3-3										5				
3-4						9	15							
3-5						9	15							
3-6												12		
3-7							14							
3-8							12							
3-9						12	15							
3-10		15												
4-1														3
4-2			4					3						
4-3														4
4-4														5
4-5														3
4-6														12
4-7														7
4-8														4
4-9														6
4-10														15
4-11														10
4-12														15

	Upper member		Middle member					Lower member					Basement	
	ss	siltstone shale	cg	v.c. ss	c. ss	m-f. ss	siltstone shale	ls	cg	v.c. ss	c. ss	m-f. ss		siltstone shale
4-13														26
4-14														13
4-15														14
4-16														6
4-17											5			
4-18										5				
4-19										5				
4-20										5				
4-21											4			
4-22											6			
4-23											7			
4-24											7		11	
4-25											7			
4-26											8			
4-27											4			
4-28											9			
4-29						6								
4-30											8			
4-31						6								
4-32											10			
4-33											8			
4-34											9			
4-35	5													
4-36														
4-37			10											
5-1														4
5-2														4
5-3														4
5-4														3
5-5														6
5-6														5
5-7														2
5-8														5
5-9														4
5-10														4
5-11														4
5-12											8			
5-13														5
6-14											7			
5-15											8			
5-16											8			
5-17						5								
5-18						8					11			
5-19											7			
5-20											10			
5-21											9			
5-22														
5-23											6			
5-24											9			
6-1														7
6-2														7



Result of Radioactive Measurement (2)

	Upper member			Middle member					Lower member					Basement		
	ss	siltstone	shale	cg	v.c. ss	c. ss	m-f ss	siltstone	shale	ls	cg	v.c. ss	c. ss		m-f ss	siltstone	shale
6-3														10		
6-4										7						
6-5							10									
6-6								10								
6-7							10									
6-8			9													
6-9			11													
6-10			12													
7-1										8						
7-2															10	
7-3										8						
7-4								13								
7-5					10			12								
7-6			12													
8-1																4
8-2										6						
8-3													10			
8-4													11			
8-5													10			
8-6																10
8-7										6						
8-8													8	11		
8-9										6						
8-10													8			
8-11										5						
9-1																10
9-2																5
9-3										6						
9-4										6						
9-5										6						
9-6													7			
9-7													5			
9-8													12			
9-9										7						
9-10										8						
9-11													11			
9-12										7						
9-13													8			
9-14										7						
9-15													8			
9-16										7						
9-17													9			
9-18										7						
9-19													8			
9-20										7						
9-21										7						
9-22													8			
9-23										11						
9-24													7			
9-25										9						
9-26										13						

	Upper member			Middle member					Lower member					Basement		
	ss	siltstone	shale	cg	v.c. ss	c. ss	m-f ss	siltstone	shale	ls	cg	v.c. ss	c. ss		m-f ss	siltstone	shale
9-27														10		
9-28													10			
9-29														12		
9-30														16		
9-31										7						
9-32										9	9					
9-33														13		
9-34											11	11				
9-35											11	11				
9-36											11					
10-1																8
10-2																10
10-3													7			
10-4											11					

Book of Religious Statistics

Year	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2020
Population	1,000,000	1,200,000	1,500,000	1,800,000	2,100,000	2,400,000	2,700,000	3,000,000	3,300,000	3,600,000	3,900,000	4,200,000	4,500,000	4,800,000	5,100,000	5,400,000
Births	100,000	110,000	120,000	130,000	140,000	150,000	160,000	170,000	180,000	190,000	200,000	210,000	220,000	230,000	240,000	250,000
Deaths	80,000	90,000	100,000	110,000	120,000	130,000	140,000	150,000	160,000	170,000	180,000	190,000	200,000	210,000	220,000	230,000
Immigrants	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000	130,000	140,000	150,000	160,000	170,000
Emigrants	10,000	15,000	20,000	25,000	30,000	35,000	40,000	45,000	50,000	55,000	60,000	65,000	70,000	75,000	80,000	85,000
Net Migration	10,000	15,000	20,000	25,000	30,000	35,000	40,000	45,000	50,000	55,000	60,000	65,000	70,000	75,000	80,000	85,000
Population Growth	100,000	125,000	160,000	205,000	250,000	300,000	350,000	400,000	450,000	500,000	550,000	600,000	650,000	700,000	750,000	800,000

