Notes on the petrography of the Kugrua Sandstone in the Husky NPR Operations Inc. (U. S. Geological Survey) Peard Test Well No. 1.

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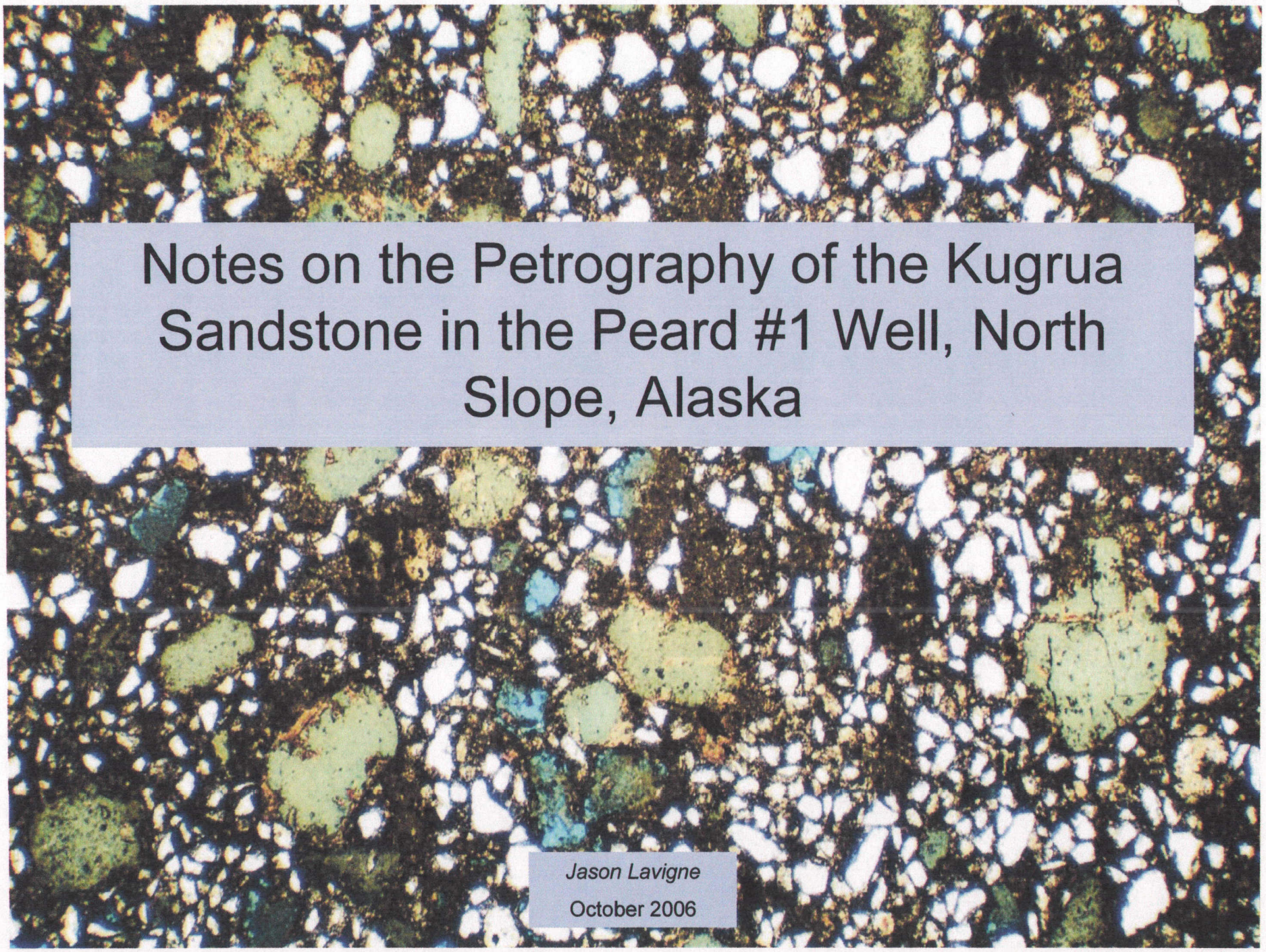
NOTES ON THE PETROGRAPHY OF THE KUGRUA SANDSTONE IN THE PEARD #1 WELL NORTH SLOPE, ALASKA

Jason Lavigne,
October 2006



Notes on the Petrography of the Kugrua Sandstone in the Peard #1 Well, North Slope, Alaska

Jason Lavigne

October 2006

INTRODUCTION

Several thin sections from the Peard 1 Well were examined to evaluate the pore system and reservoir potential the Kugrua interval. These thin sections are part of the collections housed at Eagle River, Alaska.

This brief report represents the results of a "quick look" examination. More detailed petrographic examination would be desirable and XRD and possibly SEM analysis of the clay species present should be undertaken to define the clay types and nature of the interparticle pores. Detailed point counts would be useful to quantify this non-effective porosity.

Lithology

• Very fine-grained wacke with major constituents consisting of quartz, lithics, glaucony and phosphate grains. There is abundant mudstone matrix that appears illitic (or illite/smectite/kaolinite in various combinations). Ferroan dolomite occurs as a secondary cement. Siderite is locally abundant.

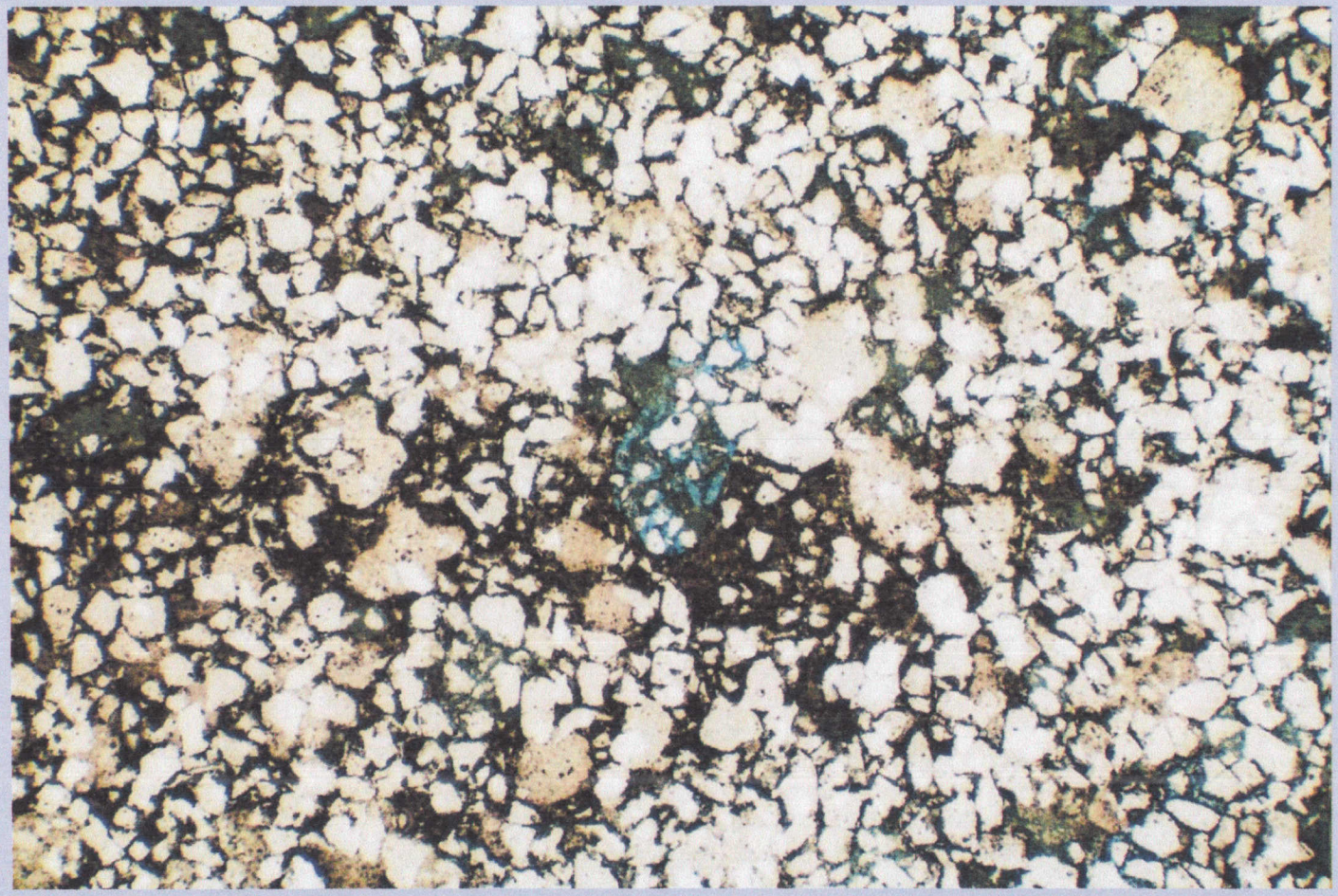
Pore System

• Consists primarily of inter-particle pores within clays. There is some secondary enhancement resulting in grain molds after the dissolution of glaucony pellets and also a contribution due to the dissolution of the matrix clay. Generally speaking, this interval would be expected to have very low permeability and much of the core analysis measured porosity would be non-effective micro pores within matrix clay.

Depositional Setting

• The presence and abundance of glaucony and phosphate suggests deposition during a period of relatively low sedimentation rates, probably a lowstand in sea level. It has likely undergone a component of transgressive reworking.

Peard #1



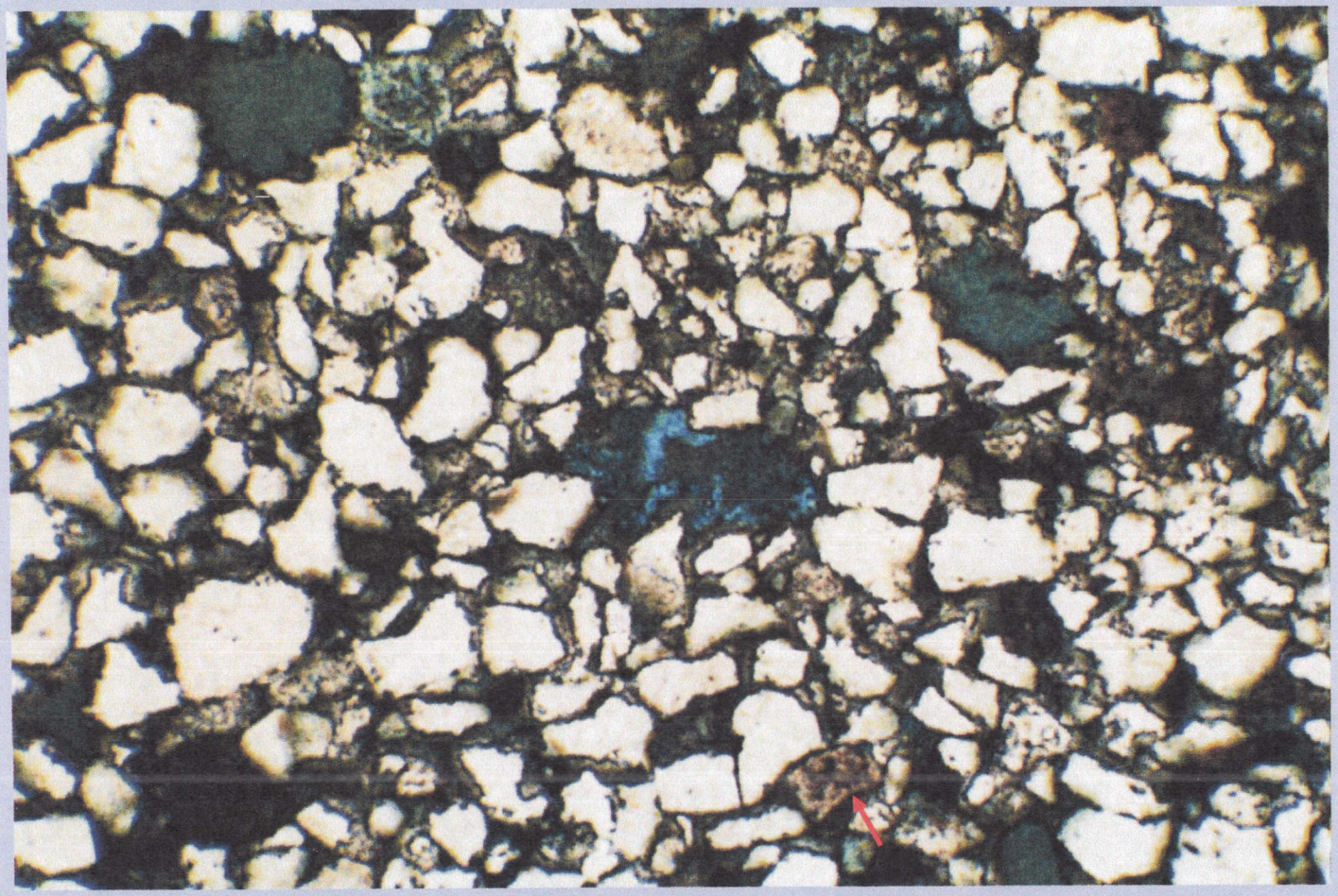
200µ

Dissolution of a glauconitic grain (center) creating a secondary pore. The darker clay (horizontally along the center) represents a mud-rich, *Phycosiphon* burrow fill.

7839.3ft

Kugrua Sand (Jurassic)

Peard #1



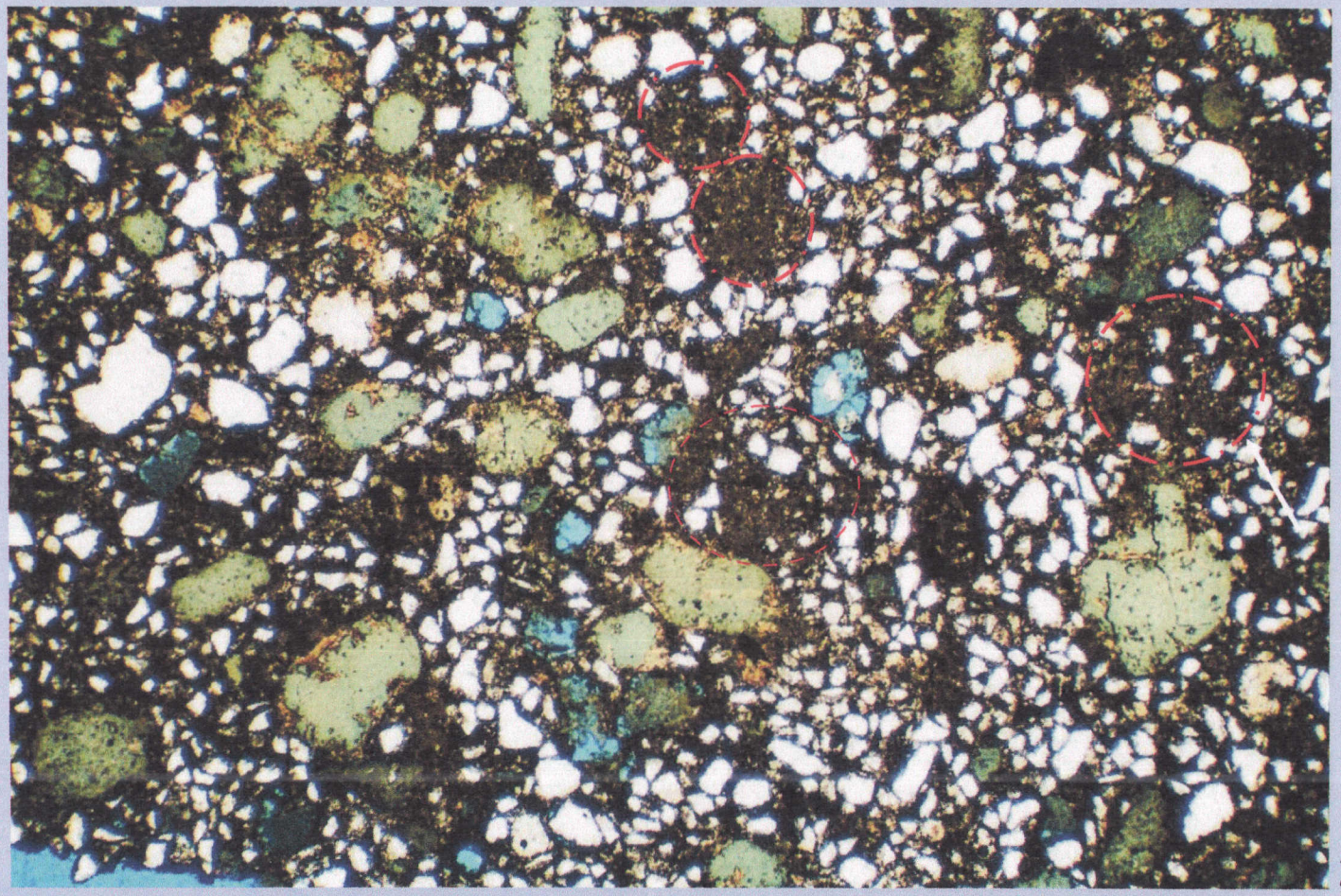
100µ

Leaching of a glaucony grain (center) creating a secondary pore (pore space is blue). Note also the phosphate grain (arrowed).

7839.3ft

Kugrua Sand (Jurassic)

Peard #1

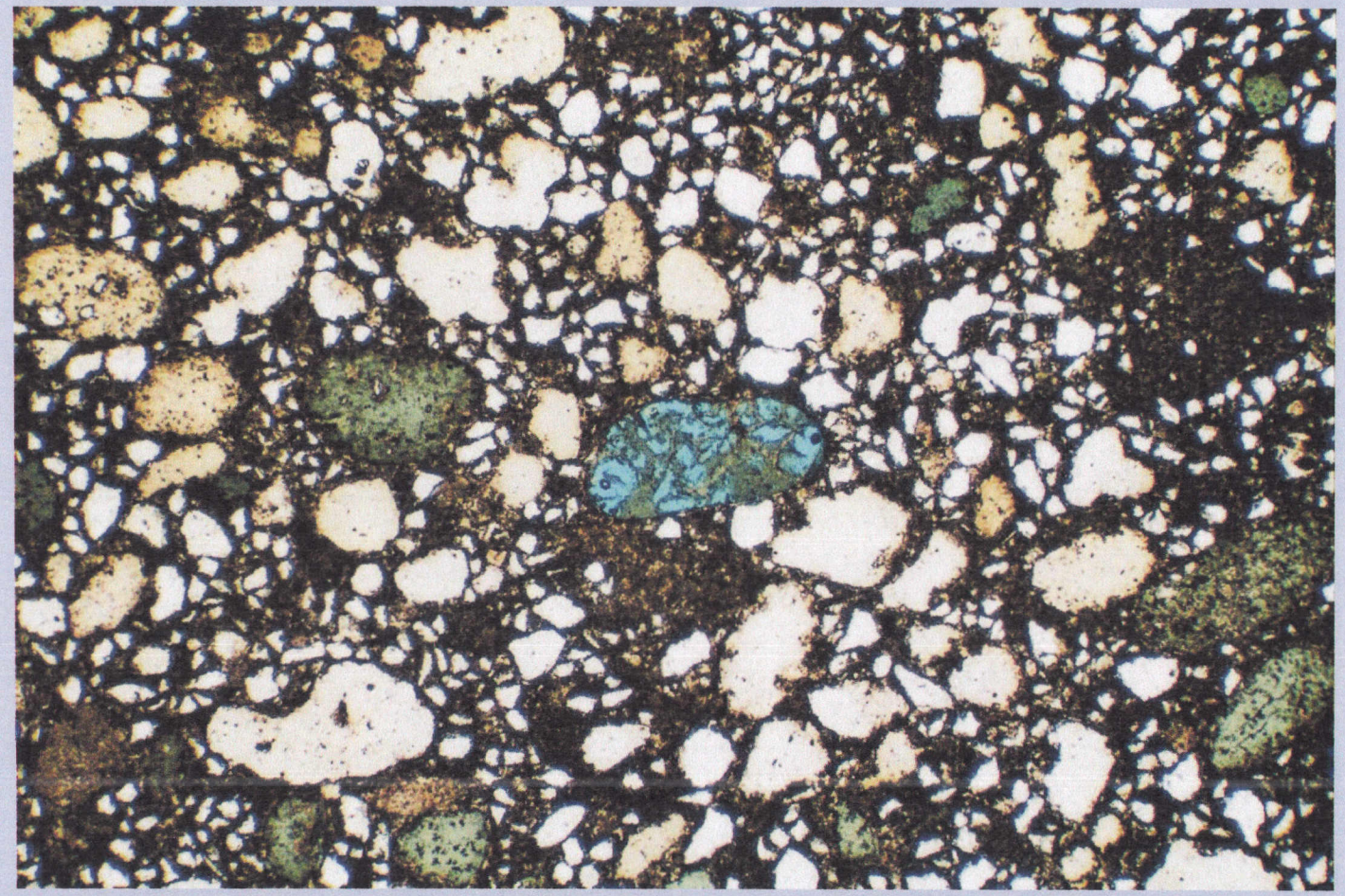


Very fine-grained wacke. Secondary pores are being created by the leaching of both glaucony grains and detrital (and biogenically emplaced) clay (brown). Some of the circular geometry of brownish clay is directly related to *Phycosiphon* burrow fills (examples outlined). Note the alteration of the glaucony grains (yellow around the edges).

7842.2ft

Kugrua Sand (Jurassic)

Peard #1



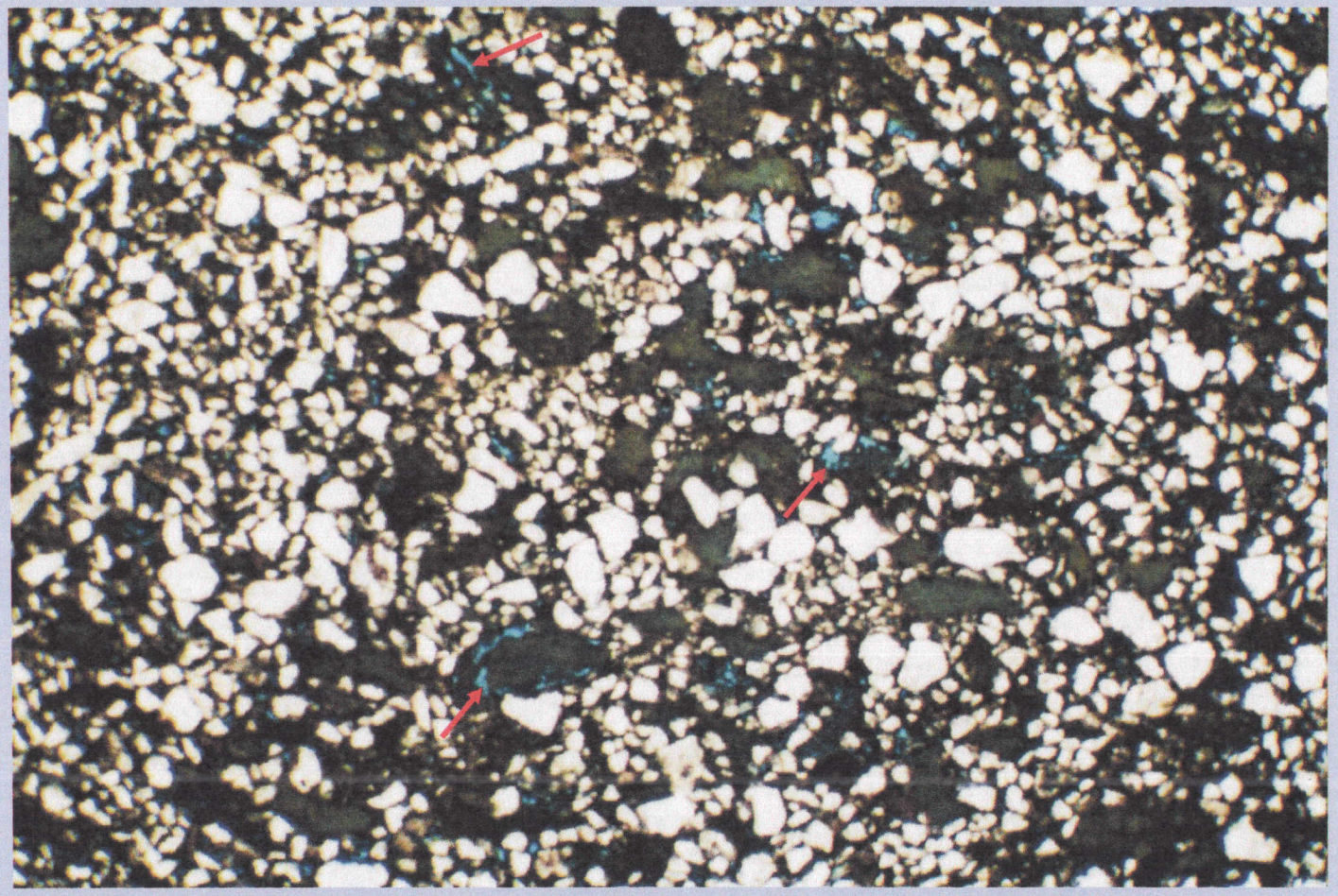
100μ

Partially leached glaucony grain (center) creating a secondary grain mold. There is almost no other visible porosity.

7842.2ft

Kugrua Sand (Jurassic)

Peard #1

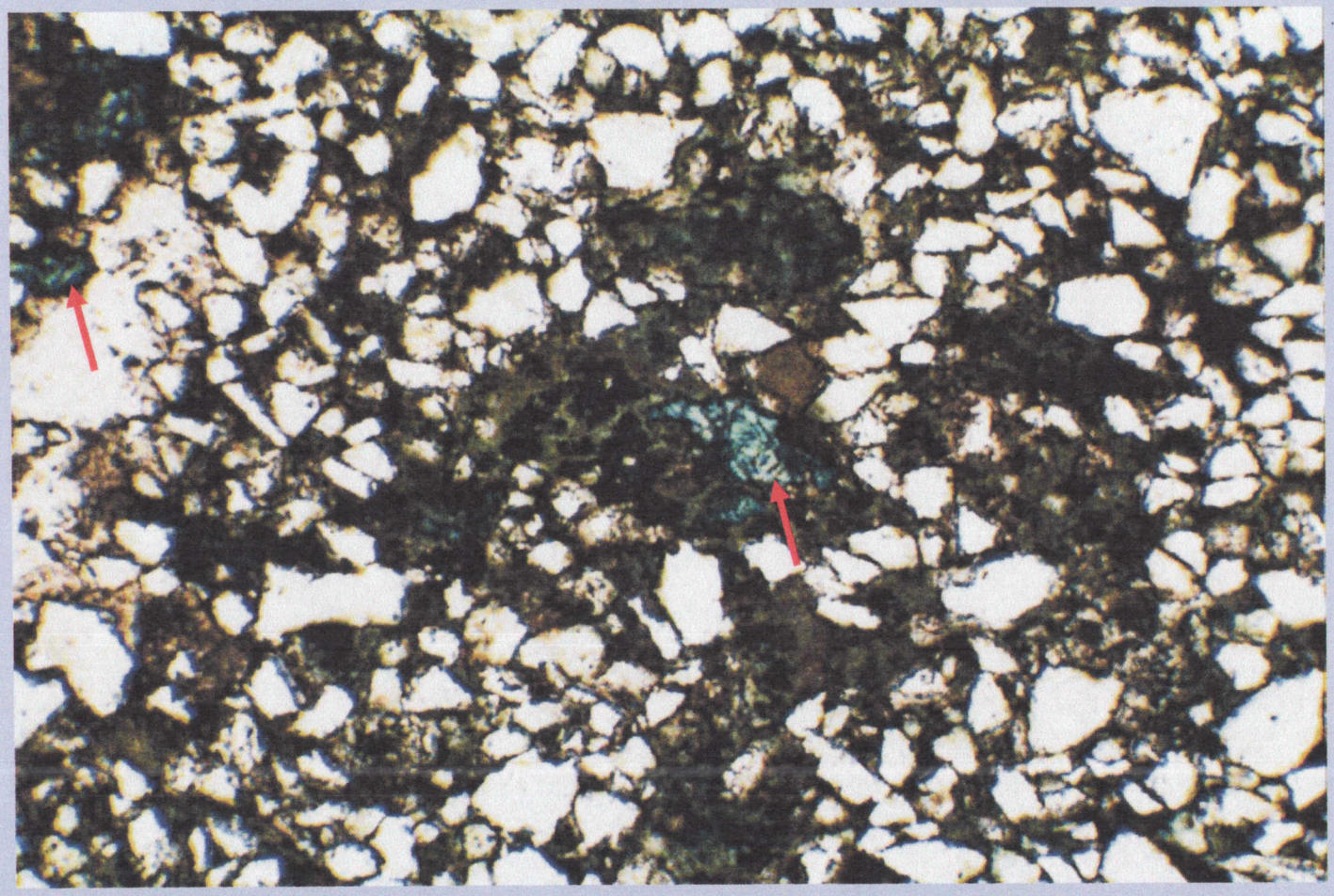


Secondary pore system (blue) developed in a very fine-grained wacke. There are two kinds of pores with the most conspicuous being secondary grain moulds after leached glaucony grains (arrowed). The remainder of the pore system consists of small, sparse and isolated pores created as a result of matrix clay dissolution.

7842.6ft

Kugrua Sand (Jurassic)

Peard #1

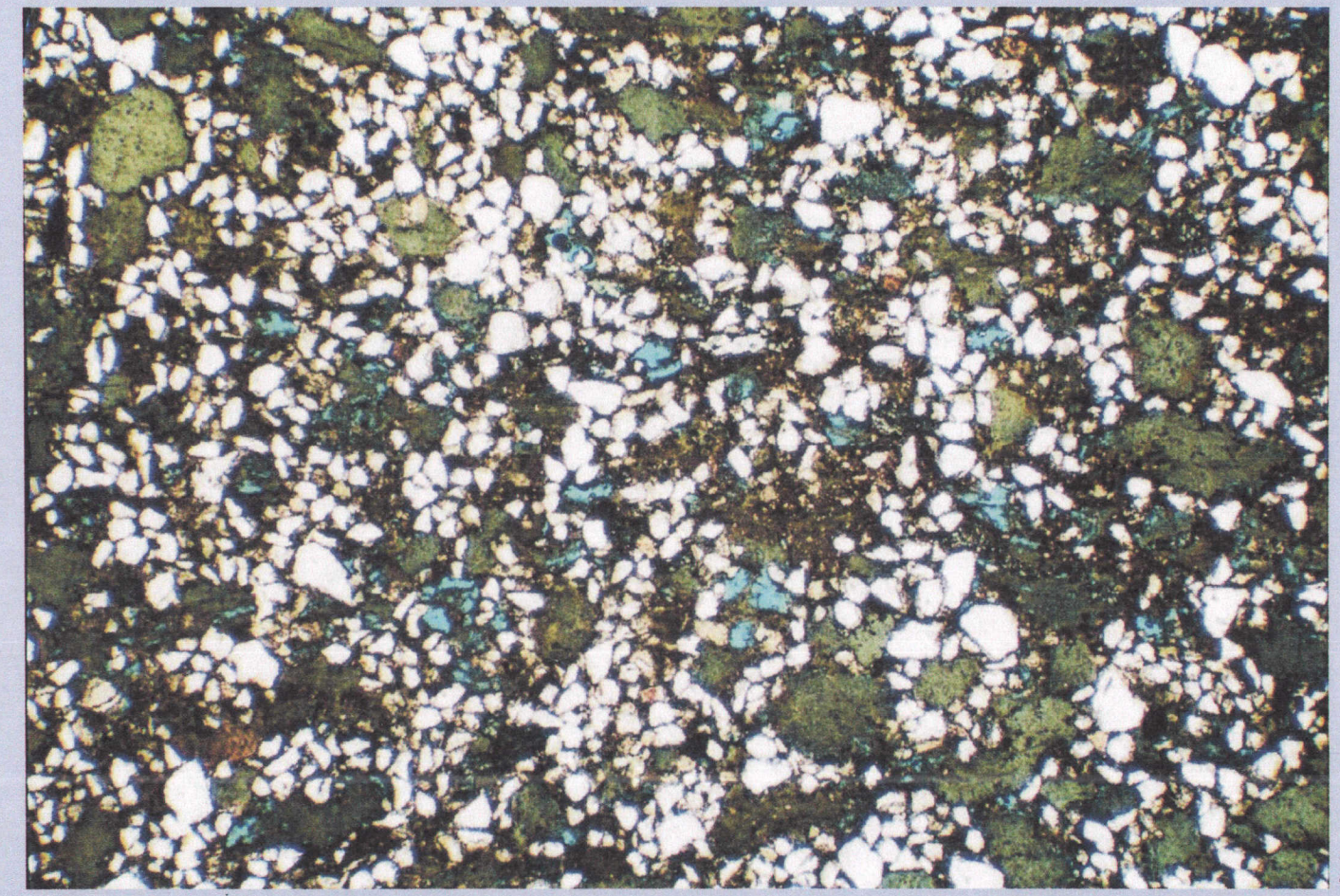


Very fine-grained, glauconitic wacke. The glaucony has been compacted to form a pseudo matrix and has been partially replaced by ferroan dolomite cement (arrowed). In addition to dolomite, it also appears to be undergoing replacement by pyrite (black).

7842.6ft

Kugrua Sand (Jurassic)

Peard #1

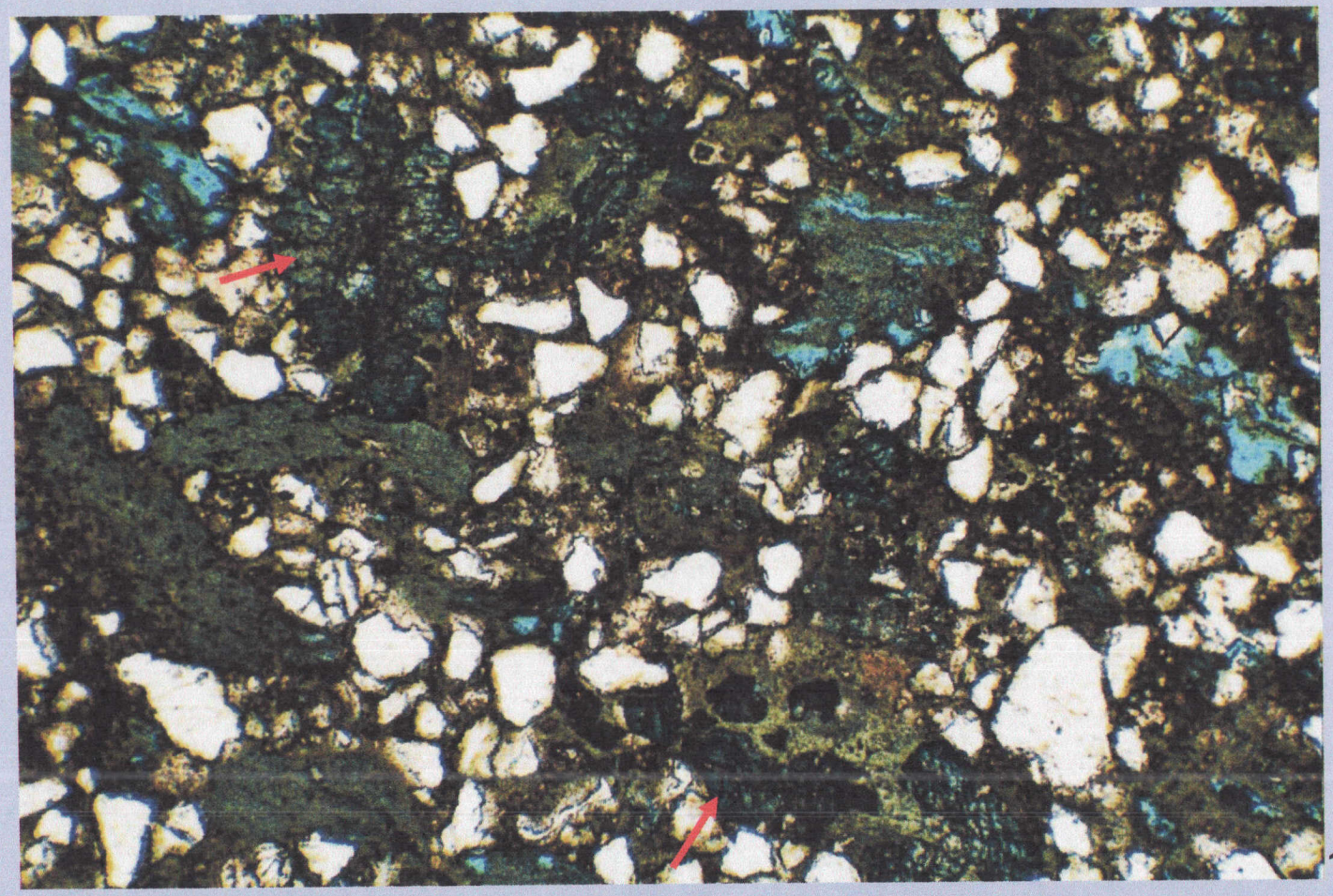


Patchy distribution of porosity (light blue) in a very fine-grained wacke containing larger glaucony grains (green). The pore system is entirely secondary and is created by the leaching of both glaucony grains and detrital clay matrix.

7850.5ft

Kugrua Sand (Jurassic)

Peard #1

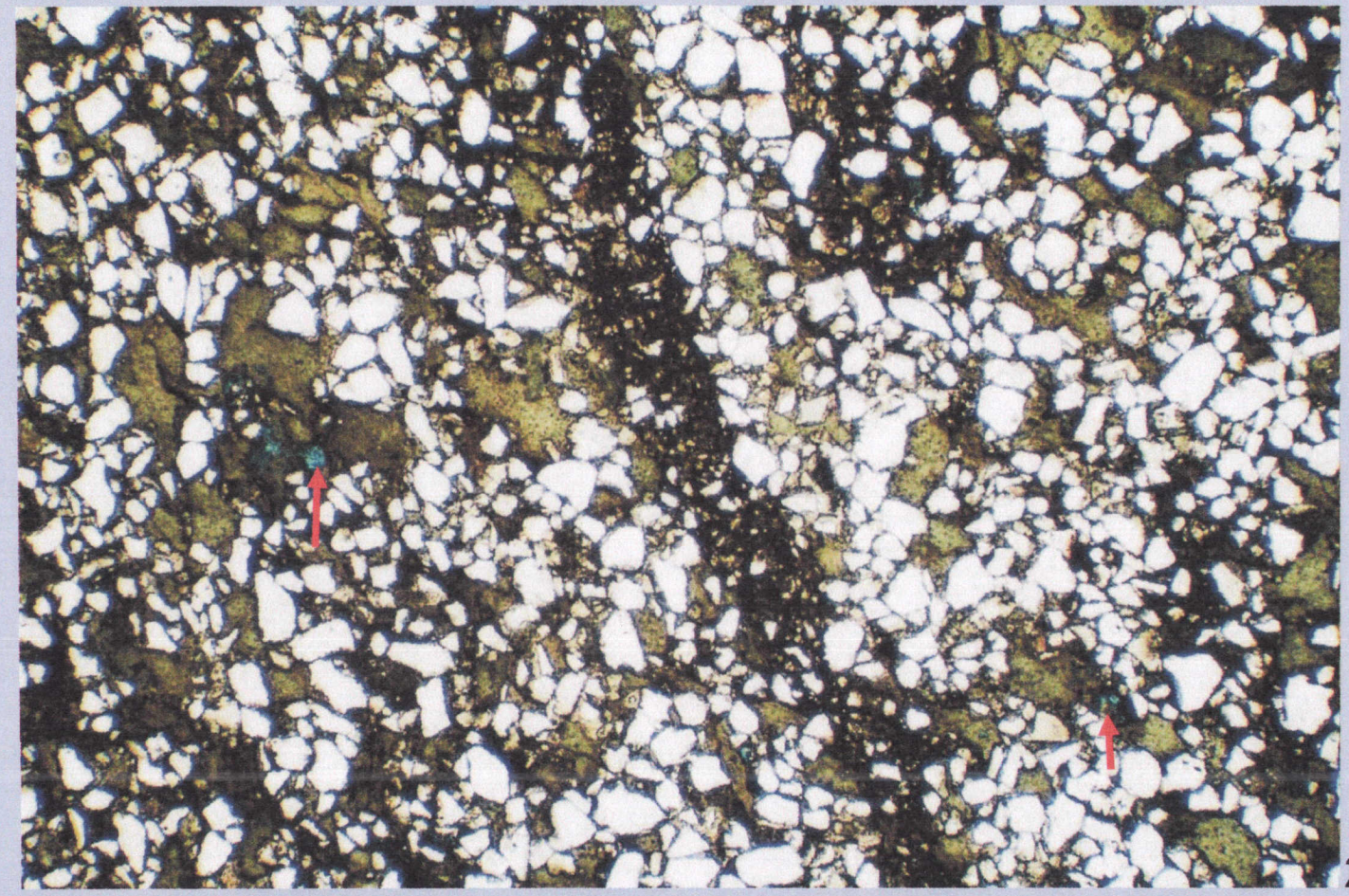


Detail of the dissolution of compacted glaucony grains to generate secondary porosity (bright blue). Note the replacive ferroan dolomite cement (arrowed). Visible porosity in this slide is limited almost entirely to dissolution of discrete glaucony grains.

7850.5ft

Kugrua Sand (Jurassic)

Peard #1

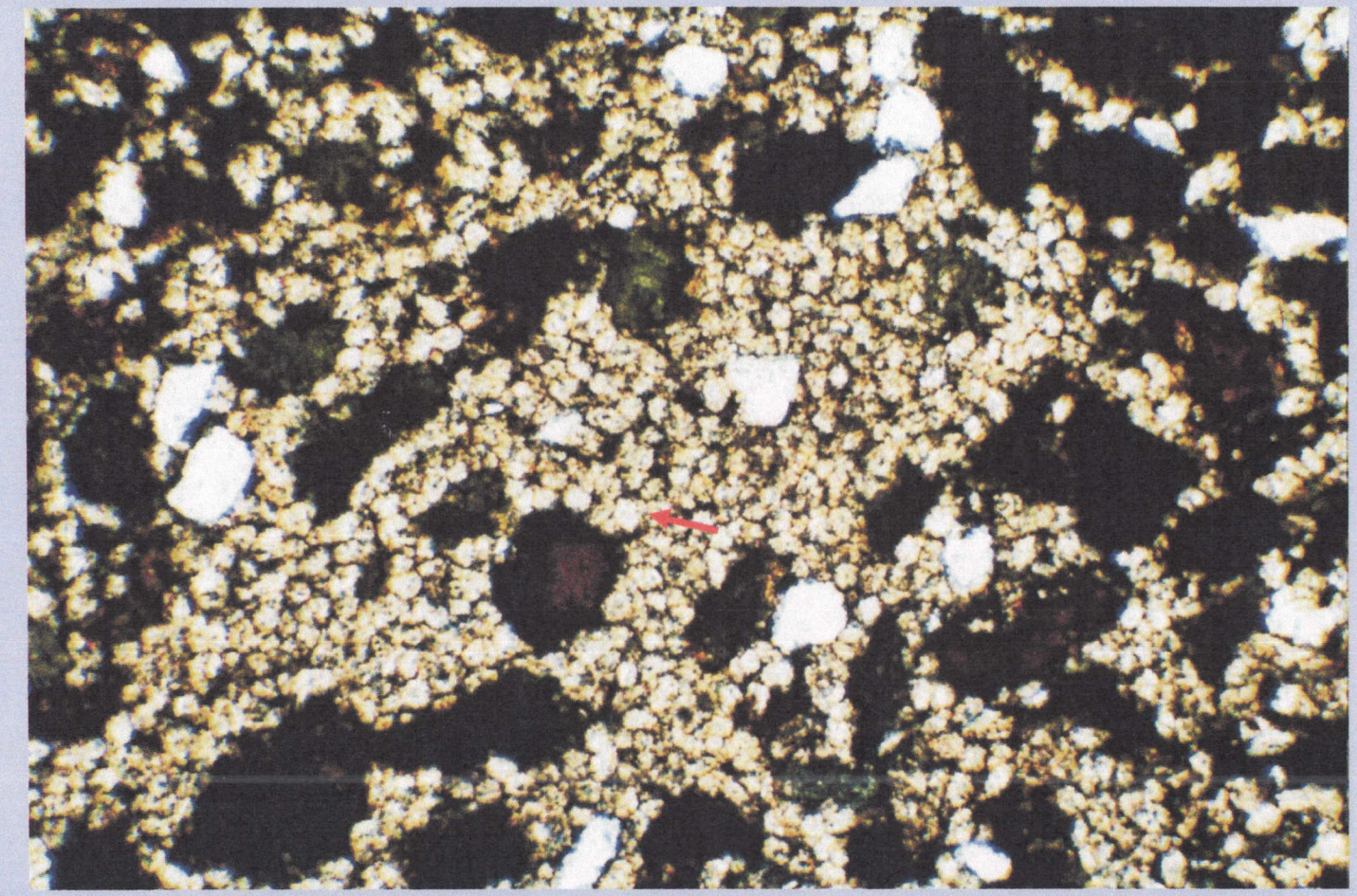


Very patchy secondary porosity (arrowed) in an otherwise tight, very fine-grained wacke. The greenish grains are glaucony which is locally compacted to form pseudo matrix and leached to form secondary pores. The strip of darker clay (vertical in the centre) represents a *Phycosiphon* burrow-fill.

7858.2ft

Kugrua Sand (Jurassic)

Peard #1



100μ

Iron-cemented grains (dark), quartz (white) and glaucony (green) in a mass of siderite cement (arrowed). The original composition of the dark grains is unknown. The may have originally been glaucony (altered to goethite) or possibly phosphate grains.

7867.4ft

Kugrua Sand (Jurassic)