

PICKING UP GRAINS*

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Picking grains out of oil

Mrs. Lindberg's ingenious method of fishing grains from oil¹ is better adapted to young, deft hands than to old, clumsy ones; mine, at any rate, have not been able to make it work with the straight pipette that she describes. I have had good success, however, with a curved one, somewhat like the "contact pipette" described in connection with another method.² In holding a curved pipette, the hand is steadied by resting it on the stage of the microscope, thus obtaining the same advantage that a marksman gets by shooting from a rest.

The ordinary contact pipette, with tip-diameter of 1 mm. or more, will not answer the purpose, as I found out years ago, before learning how to make pipettes that were really slender. The tip of a pipette used for picking up grains ought not to be over 0.5 mm. in outer diameter; the smaller the tip the better the implement works, provided the calibre is large enough to admit the desired grains without jamming. It is possible to make a pipette with a tip as little as 0.2 mm. in diameter, but one so slender as that is extremely fragile, and a tip diameter of 0.4 mm. is generally small enough. For ease of manipulation, the drawn-out part of the finished pipette should not be more than 5 cm. long, and the main body not less than 9 cm.

The implement can be made as follows. One end of a piece of thin-walled tubing, about 5 or 6 mm. in diameter and 10 or 11 cm. in length, is softened in a Bunsen flame and drawn out. This operation is repeated once or twice, so that the thickness will diminish abruptly. The drawn-out part is then broken off about 6 cm. from the shoulder, and, while the tube is held in a clamp at an inclination of 45°, the bend is made by momentarily applying heat at the chosen point with the flame of a match. Finally the end is broken square across, about 5 mm. from the bend, on a fine scratch made with a chip of quartz.

A sleeve of soft rubber tubing may be slipped over the butt end of the tube, beyond which it should project about 3 or 4 cm. This sleeve is not absolutely necessary, and it need not be closed at the end.

When the pipette is about to be used, it should be allowed to imbibe as much clean oil as it will when rather steeply inclined; for if the tip is

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¹ Lindberg, Marie L., A method for isolating grains mounted in index oils: *Am. Mineral.*, 29, 323-324 (1944).

² Calkins, F. C., Transfer of grains from one liquid to another: *Am. Mineral.* 19, 143-149 (1934).

inserted amidst the grains when the pipette is empty, a strong current is set up that may quickly sweep in many grains at once. The desired grain had better be isolated by means of a mounted needle, and the tip of the partly charged pipette placed immediately to its right; one can then see the grain slide into the tube. If the tip is now brought into close contact with a dry part of the slide and raised, a droplet of oil will be left, and this droplet, or the second or third similarly formed, is likely to contain the captured grain. If the grain fails to appear, or if several grains have been captured, the catch may be retrieved by expelling the oil. This can be done by blowing, but a tidier method is to fold and pinch the rubber sleeve. If the bend near the tip points down during this operation, the expelled oil will hang from it, and can be gently deposited on a slide, with the captured grains huddled in its midst.

Most of the oil can then be removed with the same pipette or with another of the "drinker" type,³ and the remainder pushed aside, as Mrs. Lindberg advises,⁴ with acetone. This can be done conveniently by bringing a contact pipette charged with acetone several times in contact with the slide close to the grains. To avoid any contamination of the new oil with a remnant of the old, the grains may be transferred to the new oil by means of the mounted needle, to which they will readily adhere if it is coated with the thinnest possible film of oil. Several grains at once can be picked up in this way, and if, as often happens, a few unwanted grains have been captured, they can be left behind.

A curved pipette, even in a none-too-steady hand, will pick up a chosen grain as little as 0.05 mm. in diameter. But my "grain-lifter"⁵ will do the same thing, usually in less time, and, unlike the pipette, will pick up only the grain that is wanted. A lifter can be made more easily than a very slender pipette; the simplest way to make one is to stick a bit of wire or a small needle into a wooden handle, bend it down (a needle must first be slightly detempered), and grind a sole on the end. In this form the lifter is almost indestructible, whereas a suitable pipette is more or less fragile. The other pipettes, which may be 1 mm. or more in tip-diameter, are easily made and not too easily broken. The lifter method, therefore, still seems worthy of consideration, especially with certain improvements made since it was first described.

One "bug" in the lifter method was the fact that neither vaseline nor balsam could be used in oils of high refractive index, which rapidly dissolve both. (The amount of vaseline dissolved in other oils is so small that its effect on refractive index is negligible.) Mucin, gotten by touch-

³ Calkins, F. C., *op. cit.*, p. 145, fig. 1C'.

⁴ Lindberg, Marie L., *op. cit.*, p. 324.

⁵ Calkins, F. C., *op. cit.*, p. 145, fig. 1d.

ing the sole of the lifter to the tongue, works in oils of high index, and also in most others, but it cannot be removed with xylol. It can be washed away, however, with acetone, once the grain is detached from the lifter. Relatively large, thick grains usually come off when brought in contact with a dry part of the slide, but a thin, flat grain may adhere tenaciously. This difficulty can be obviated by using glycerine, which will serve as the adhesive in all oils but those that contain alcohols; in such oils glycerine, and also mucin, is somewhat soluble. The charge of glycerine must be extremely small; enough is taken up by barely touching the sole of the lifter to a film or droplet of the liquid. If a grain picked up with glycerine is not readily detached, the oil can be washed off in a droplet of xylol and the grain then freed by immersing it in a tiny droplet of glycerine, which can be washed away with acetone.

Vaseline may be used in oils of low index, and optionally in oils of moderate index. The cleaning process formerly described⁶ can be shortened. A single droplet of xylol will not only release the grain but leave it almost clean; the cleaning can then be completed with acetone and the grain transferred in the manner described above.

At least nine times out of ten the lifter method, with mucin as the adhesive, will do the work. If thin flakes or very fragile grains are to be picked out, the pipette method is the better; and I hope this note will make it more widely available to young and old.

Needle chisels

Adherence of dry particles to an oiled surface can be utilized in taking a small sample from any megascopic grain in a hand specimen. This can be done, without mutilating the specimen, by means of a chisel consisting of a piece of a heavy darning needle set in a stout wooden handle. It is convenient to have the bit set at an angle of about 30° to the axis of the handle; a blunt edge is then made by grinding a bevel normal to that axis. If the bit, thinly coated with oil, is pressed against the grain and given a rocking motion, most of the fragments detached will adhere, and they will be released when the bit is dipped in a droplet of oil. Or if the chisel is immersed in a large droplet of xylol dipped up in a wire loop—which, in order to take a full charge, should be horizontal when dipped and be raised quickly—the grains will collect in the bottom of the droplet. If the droplet is then touched to a piece of absorbent paper, white or black according to whether the mineral is dark or light, the xylol will sink in, and the grains, virtually free from oil, will be left in a shallow heap, from which a few at a time can be transferred with a

⁶ Calkins, F. C., *op. cit.*, p. 149.

needle to various oils. A good background for light-colored grains is afforded by the black paper used in making photograph albums.

This heavy chisel is of course an adaptation of the small needle-chisel used by Short⁷ for digging samples from polished sections. Short's chisel apparently has the bit in line with the handle, but when the bit is set at an angle it cuts better, and is also less liable to break. Murdoch⁸ recommends a needle set at an angle of 30° for testing hardness. A very small needle chisel can be used for digging out a grain, or part of one—e.g. the core of a plagioclase crystal—from a thin section.

Magnetized needle

A thick permanently magnetized needle will pick grains of magnetite, and small ones of pyrrhotite, out of oil. It can also be used for distinguishing magnetite, pyrrhotite, and pyrite from one another in a covered oil mount: if the needle is slid about on the cover glass, magnetite grains will follow it, while pyrrhotite will only stir a little and pyrite will remain motionless.

⁷ Short, M. N., *Microscopic Determination of the Ore Minerals: U. S. Geol. Survey, Bull. 825*, p. 119, fig. 11 (1931).

⁸ Murdoch, Joseph, *Microscopical Determination of the Ore Minerals*, p. 29, fig. 7 (1916).