

Making sense from cinders

A FIRST CENTURY BC DOCUMENT FROM ITALY ~ PRESERVED, BUT OBSCURED, BY THE ASHES OF MOUNT VESUVIUS ~ HAS BEEN BROUGHT TO LIFE, WRITES S ANANTHANARAYANAN

The great eruption of Mount Vesuvius in 79 AD destroyed many cities in the Campania region in southern Italy, especially Pompeii and Herculaneum. But the 100-ft thick layer of volcanic material that covered the cities has also captured living habitations, and their Greco-Roman culture, for future generations of historians to study.

After the buried cities were first discovered, while digging for wells or by treasure-seekers, Charles III, the Bourbon prince who became King of Naples in 1734, ordered what has turned out to be the first systematic archaeological excavation. The project was entrusted to a Spaniard, Roque Alcubierre, who is said to have been insensitive to the value of what he was uncovering, but his assistant, Carl Weber, a Swiss engineer, made sketches and drawings of the ancient city of Herculaneum and is credited with the discovery of the magnificent *Villa dei Papi*, the seaside mansion thought to have been built by Julius Caesar's father-in-law.

Along with the architectural marvels of the palace, a small room was also discovered, thought to be a library ranged with shelves filled with hundreds of handwritten rolls of papyrus — from which the mansion has got its name. This rich collection of philosophical texts is now mainly stored in the *Officina dei Papi* in the National Library of Naples, but six rolls were gifted in 1802 to Napoleon Bonaparte, then First Consul of France, and these are in the collection at the Institut de France in Paris.

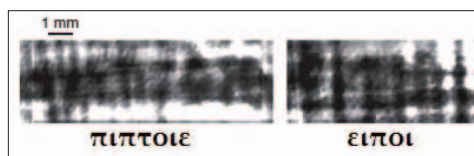
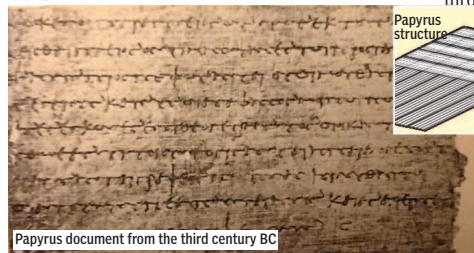
But though the rolls of papyrus are preserved, they have been completely carbonised by the hot gases, steam and mud that swept over the town. The result is that they are fused, brittle and difficult to separate. And as the black ink that was used was carbon-based, derived from smoke residue, the writing can scarcely be distinguished from the carbonised papyrus sub-stratum. Father Antonio Piaggio, a conservator from the Vatican, developed a procedure to open at least some of the rolls. This has had limited results and another method recently tried, which involves separating the papyrus into small pieces, has also been abandoned, to

save the texts till an effective method is found.

But there has been some progress in making out the writing in some of the rolls that have been opened. The methods used include binocular microscopes and digital photography, with arrangements to isolate frequencies of light that belong to a narrow band in the near-infrared. But these methods can be used only where the rolls have been opened, not with the rolled up texts, as the writing overlaps and near-infrared light cannot penetrate the material. Usual X-Ray methods do not work because the base and the writing are equally transparent and throw no shadow. For the same reason, even the versatile technique of the CT scan — computed tomography, where a computer builds up a 3D image — cannot be used. Even X-Ray fluorescence — which has helped imaging of writing covered with chemicals, or mould, by causing the writing to glow — is of no use to find carbon on carbon!

But a new X-Ray method, which relies on the slightly longer time that X-Rays take to traverse the writing on the papyrus, has been devised and this has shown promising results. Vito Mocella, Emmanuel Brun, Claudio Ferrero and Daniel Delattre, from the CNR-IMM Istituto per la Microelettronica e Microsistemi-Unita di Napoli, the European Synchrotron at Grenoble, Ludwig-Maximilian-Universität in Munich and the CNRS-IRHT Institut de Recherche et d'Histoire des Textes, Paris, report in the journal *Nature Communications* that X-Ray Phase Contrast Tomography, as the method is called, is able to reveal Greek letters inside the precious papyri without unrolling them. "This attempt opens up new opportunities to read many Herculaneum papyri, which are still rolled up, thus enhancing our knowledge of ancient Greek literature and philosophy," they say.

Papyrus, the most common material used for books and documents in ancient times was constructed from stalks of the papyrus plant. Strips about 40 cm long, which had been soaked in water, were first placed next to each other, the edges slightly overlapping. Another set of strips was then placed on the first lot, but length-wise. The mat of papyrus fibre was then hammered so that the layers were mashed into a single sheet. The sheet was then dried under



pressure, and finally polished to yield a smooth writing surface. The sheet could also be built on as a longer roll, for longer documents. Writing was first on the side where the fibres were along the length, or the *recto*, and then on the other side, or the *verso*.

In dry climates, as in Egypt, papyrus was stable and could last a long time. But this is not true of more humid places, as the Mediterranean, and most papyri found in Europe have deteriorated. The papyri of Herculaneum were saved from deterioration by the covering of volcanic matter, which formed into a kind of soft rock, but the pressures compressed the scroll and deformed its internal spiral form, with layers chaotically entangled.

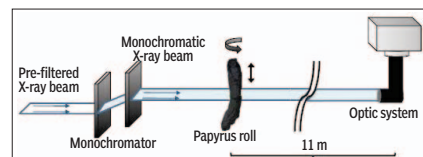
While there is, hence, little chance of getting an unobstructed view of any surface of single papyrus sheets, in the XPCT method different parts of the X-Ray beam that passes through the complete roll emerge after having passed through different thickness of carbon. As X-Ray waves move slower through carbon than through air, some parts of the beam, which have gone through places where there was writing, emerge tiny instants later than other parts, which did not pass through writing or have passed through less writing. Places where the X-Ray beam is detected, after passing through the scroll, would hence receive waves at different stages of their wave motion, or different phases, from different parts of the scroll, and these would interfere, getting weaker or cancelling out when the phases are opposed.

Detecting the strength of the transmitted X-Ray beam while the scroll is rotated to scan different paths would then collect a mass of information. Complex computer processing could then discern individual shapes of the thicker carbon, at the same depth, and hence an indication of shapes and writing.

The reconstruction has been challenging, the authors of the paper say, but they have succeeded, nevertheless, in forming images of some of the letters in the two rolls that are preserved in Paris. One of the rolls has been partly opened while the other is still rolled up. The first trial, in a piece of the opened document, reads one word as $\pi\tau\omega\tau\omega\epsilon$ (*pi iota pi tau omicron iota epsilon*), which could mean "would fall", and another word in the next line as $\epsilon\pi\sigma\iota\omega\tau$ (*epsilon iota pi omicron iota*), meaning "would say". The unopened roll was naturally more challenging and here just a few letters in sequence have been imaged. But from different sections, 24 Greek letters have been discerned, the fact that important Greek text mostly used capital letters

being a definite help. But the fact that XPCT is able to read inside carbonised papyrus rolls holds out the promise that whole documents, even other texts, or scrolls yet to be discovered, may some day be reconstructed. The suggestions, from study using traditional methods, of texts already opened indicate that the bookshelves of *Villa dei Papi* may be the personal library of the Epicurean philosopher, Philodemus (110-35 BC), who is known for versatile scholarship. Being able to resurrect his works would rekindle the excitement there was when the library was first discovered.

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LATEST ADVANCES

THE GOOD NEWS IS THAT THE CURRENT SURVIVAL RATE FOR PROSTATE CANCER IS MORE THAN 97 PER CENT IF DIAGNOSED EARLY, WRITES DR NP GUPTA

Every year, a whopping 1.5 million prostate cancer cases among men are detected in India, of which 85 per cent fall into stage four category, meaning that doctors do not give them more than three years to live. The irony is that, unlike other cancers, the chances of treating prostate cancer are almost 100 per cent if it is detected early, according to specialists.

The greatest risk factor is age and this risk increases significantly after the age of 50 for men with no family history of the disease. About two-thirds of all prostate cancers are diagnosed in men aged 65 and older. The older the patient, especially if over 70 years, the less aggressive the disease usually behaves. Men whose relatives have had prostate cancer are considered to be at high risk. Having a father or brother with the disease more than doubles your risk. Besides, high-fat diets, less exposure to the sun, exposure to heavy metals such as cadmium, infectious agents or smoking can put you at risk of developing the disease.

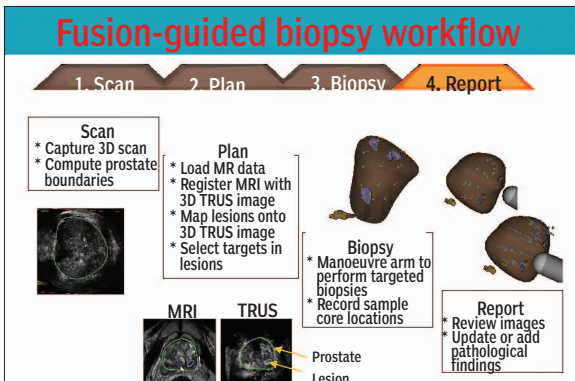
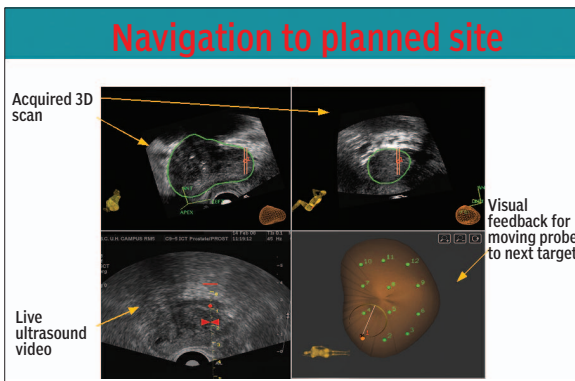
Not everyone experiences the symptoms of prostate cancer. Many times the signs are first detected by a doctor during a routine check-up. Some men, however, will experience changes in urinary or sexual function that might indicate the presence of the ailment. These symptoms include:

- A need to urinate frequently, especially at night;
- Difficulty in urinating or holding back urine;
- A weak or interrupted flow of urine;
- Painful or burning urination;
- Difficulty in having an erection;
- Painful ejaculation;
- Blood in urine or semen; and
- Frequent pain or stiffness in the lower back, hips or upper thighs.

Because these symptoms can also indicate the presence of other diseases or disorders, such as BPH or prostatitis, men need to undergo a thorough check-up to determine the underlying cause.

Diagnosis is done with a per rectal examination of the prostate. If it is hard or irregular, then cancer is suspected. A blood test PSA is done and if found to contain more than four ng/ml, then it is suspected. In such a situation, a prostatic biopsy is advisable. Previously, a trans rectal ultrasound biopsy used to be done but this was blind and did not specifically target the cancer, so diagnosis could be missed.

Accurate prostate tumour diagnosis and treatment



depends on the ability to efficiently perform a biopsy on specific areas of the prostate. In this procedure, first a multiparametric Dynamic MRI of the prostate is done. According to the images, Passive Infrared Detector (Pirad) scoring is done to indicate the specific areas of the cancer. These recorded MRI images are fused with a live trans rectal ultrasound by a doctor who performs a MRI/TRUS fusion biopsy. By fusing the MRI and live ultrasound images, a more effective targeted biopsy of the selected tissue is revealed by the MRI imaging, leading to a more accurate diagnosis and better treatment.

The good news is that the current survival rate for prostate cancer is more than 97 per cent when the disease is diagnosed early and limited to the prostate. A variety of treatment options like robotic surgery and radiotherapy are available. Of course, prostate cancer is best treated when in an early stage, but even in an advanced stage it responds to treatment options.

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Facts about cataract

THERE IS NO MEDICATION OR EYE-DROPS THAT WILL MAKE IT GO AWAY AND THE ONLY AND MOST EFFECTIVE TREATMENT IS AN OPERATION, SAYS DR BIKAS BHATTACHARYA

A cataract is a clouding or opacity of the natural lens of the eye that causes visual impairment. The natural lens is located behind the iris, or "coloured part" of the eye and opacity in the lens causes images to appear hazy or blurred. The symptoms include:

- Blurred vision;
- Seeing as though through a cobweb, or having a film over the eye;
- Frequent changing of glasses prescriptions, or seeing better without glasses;
- Rings or halos around lights;
- Severe decrease in vision with glare or bright lights in the eye;
- As the cataract progresses, it interferes with daily activities; and
- Altered colour vision.

Since most cataracts are part of the normal ageing process, they cannot be reversed. There is no medication or eye-drops or diet that will make cataracts go away. The only and most effective treatment is an operation to remove the cloudy lens. In the past, eye specialists often waited till the cataract became "ripe" and vision was very poor before suggesting one had the cataract removed. Now, with modern surgery, the operation is usually done as soon as one's eyesight interferes with one's daily life and ability to read, to work. However, once diagnosed with a cataract, your ophthalmologist needs to monitor your vision regularly for any changes and make decisions for surgery.

The clinical tests include: Visual acuity — when vision cannot be corrected to a reasonable level through refraction to perform normal activities, surgery is recommended; Slit-lamp biomicroscopy — this examination enables the surgeon to

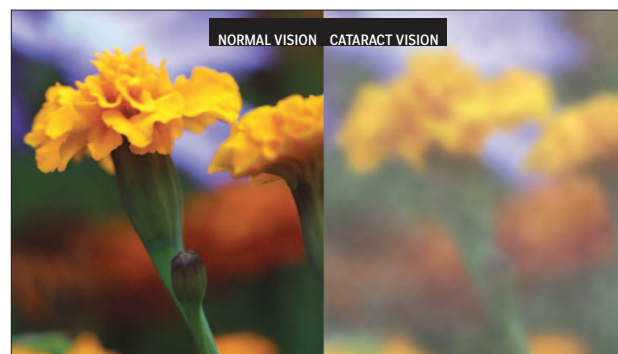
look at the cataract's location, type, grade and density in order to correlate with the degree of visual loss; Direct and indirect ophthalmoscopy — dilating drops are placed in the eye to allow the doctor a direct view of the back of the eye (optic nerve and retina). This is important to assess the optic nerve head, retinal blood circulation and any other abnormalities that may indicate surgery or afford an assessment of visual recovery; and Appplanation tonometry — this is done to rule out glaucoma.

Of the three types of cataract operations, Phacoemulsification/Phaco with IOL implantation is the most advanced technique where ultrasonic energy is used through a fine probe to emulsify the cataract and remove it. This method ensures quicker healing due to a small cut/incision, the eye remains relatively quiet, the recovery period is very short and normal day-to-day habits can be resumed quickly.

The second eye can be operated on as soon as the first eye settles down. In diabetic patients, the second eye may be operated on after a gap of three weeks. The lens implanted cannot correct vision for both distance and close-up, so one will require glasses for reading and close work. But with multifocal lens implantation, glasses are not required in a majority of cases.

After a Phaco operation, one needs to not sleep on the operated side; not shower for one week; not lift heavy objects for three weeks, avoid playing with small children and avoid dust and smoke and do not rub the operated eye.

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PLUS POINTS



Silent killer

Glaucoma causes the fluid pressure within the eye to rise. Untreated, a patient loses vision and eventually becomes blind. The disease usually affects both eyes, although one may have more severe signs and symptoms than the other. Closed angle glaucoma can occur suddenly. A patient commonly experiences pain and rapid vision loss. Fortunately, the symptoms of pain and discomfort demand quick medical help, resulting in prompt treatment that usually prevents any permanent damage. However, primary open angle glaucoma (chronic) progresses very slowly and a patient usually does not have any symptoms and even a slight loss of vision may go unnoticed. In this type, most people don't get medical help until significant permanent damage has already occurred, sometimes till a point of no return.

The signs and symptoms of primary open-angle glaucoma include a gradual loss of peripheral field of vision and this almost always affects both eyes. Sometimes a frequent change in glasses and bumping into objects, especially in low light, could be valuable indicators to an underlying problem. In advanced stages, the patient ends up with tunnel vision. Closed angle glaucoma usually involves severe eye pain, blurring of vision, the pain may be accompanied by nausea, and sometimes vomiting, almost akin to someone having gastroenteritis, lights appear to have extra halo-like glows around them and intensely congested eyes.

People over the age of 60 years have a higher risk of developing the disease. Family history also matters, as does ethnic background — East Asians, because of their shallower anterior chamber depth, have a higher risk of developing glaucoma compared to Caucasians. Females are more likely to develop glaucoma than males. Those with diabetes or thyroid problems have a much higher chance of developing glaucoma. Again, some eye injuries, especially severe ones, are linked to a higher glaucoma risk. Retinal detachment, eye inflammations and thrombosis, tumors can also end up causing glaucoma.

Treatment involves either improving the flow of fluid out of the eye, reducing its production or sometimes both. Damage caused by glaucoma is irreversible. Though the disease itself cannot be cured, regular check-ups and proper treatment can considerably slow down the progression of the disease, and even prevent further loss of eyesight.

DR TAPAS PAUL, CONSULTANT OPHTHALMOLOGIST, APOLLO GLENAGLES SPECIALITY EYE CARE CENTRE, GARIAHAT

No need for despair

Retinal detachment is a very serious eye condition that occurs when the retina separates from the tissue around it. Since it does not get oxygen and



nutrition under these conditions, you could permanently lose vision if the detached retina isn't repaired promptly. The warning symptoms include the sudden appearance of many floaters — small bits of debris in your field of vision that look like spots, hairs or strings and seem to float before your eyes; sudden flashes of light in the affected eye; or a shadow or curtain over a portion of your visual field that develops as the detachment progresses. If you get warning symptoms as described above, contact an experienced retina specialist as soon as possible. In the initial stages there may be tears in the retina that can be immediately sealed by laser therapy (slit lamp or LIO) or cryotherapy that can prevent an actual retinal detachment.

Every person must get his/her retina checked at least once in their lifetime. Sometimes there are holes in the retina that do not cause any symptoms but can cause detachment. Those with minus glass power, YAG laser polishing after cataract surgery, complicated cataract surgery or eye trauma, previous retinal detachment in one eye or a family history of retinal detachment are at greater risk.

But retinal detachment does not imply the end. There has been so much advancement in vitreoretinal surgery that we can tackle difficult and complicated cases. But the best results are obtained when surgery is promptly done within a week. This can fully restore lost vision, but the timing is very important.

The whole surgery is done with microfine instruments that are as fine as the needle used to administer a tetanus injection and there is hardly any bleeding. Extremely good retinal surgery is now done in Kolkata at various centres and there is absolutely no need for patients to go elsewhere for treatment. Apollo hospitals have now come up with a state-of-the-art eye care set-up that is equipped with the best machines and instruments required for retinal surgery.

DR ZAHIR ABBAS, SPECIALIST IN CATARACT (PHACO) AND VITREO-RETINAL SURGERY