Xenoarchaeology

This is an outline of what it takes to do a proper xenoarchaeology dig or how not to. This is more of a guide for gamers and GMs that want some idea of what goes into a dig: How it's funded, setup, protected, and most importantly, performed and operated. For your game, simply have the players do a session setting things up, trying to get the funding, dealing with contractors, getting permits, and everything else that will bedevil them.

The actual dig should be fairly quick, with a couple of scenes setting the stage. Skip the boring stuff unless you want to offer them some choices. Go straight to the problem and take it from there.

1. What is Xenoarchaeology?
   a. The study of ancient alien cultures. Typically in situ on planet and later elsewhere in a research facility.
2. What is Paleoxenotechnology?
   a. The study of ancient technology of all stripes. This includes what seems to be older style technology such as telegraphs or masonry and the high tech stuff that makes money.
3. Why would you do Xenoarchaeology?
   a. Profit$$$!
   b. New Technology!
   c. More Knowledge!
   d. Did I mention Profit$$$!
   e. Oh, and learning new things about the alien society in general.
   f. Testing theories of the origins of life, transpermia, and panspermia.
   g. And chasing after God(s) or things just like them, but not.
4. Types of Xenoarchaeologists:
   a. Dedicated researcher.
      i. Interns and graduate students.
   b. Glory Hound.
   c. Treasure Hunter
   d. Pot Stealers, Jacks, Jumpers, Tomb Robbers/Raiders, and especially, Indiannas.
      i. The big difference between Glory Hounds and Treasure Hunters and the above types, is that Glory Hounds and Treasure Hunters at least document everything they do.
      ii. Pot Stealers and Tomb Robbers/Raiders hit digs after the professionals have left. They are fairly destructive and destroy more finds than they recover.
      iii. Jacks and Jumpers raid ongoing digs, going after the finds the Xenoarchaeologists have already recovered and documented. Those go for a higher price. They may or may not leave witnesses. They may be sponsored by another government, like the Hagoni. (The Hagoni are the antagonist aliens in the RPG FTL:2448's setting. Think sentient ducks with nuclear weapons.)
      iv. Indiannas are the vigilantes of Xenoarchaeology. They try to rescue stolen items and thwart the others from pillaging a dig. Sometimes they are just as destructive as those they fight against. Always saying "It belongs in a museum" and not "Along with the context so that its place in history can be determined." They wish they were Combat Archeologists.

e. Combat Archaeologist. Deals with intact and operational ancient bases and Great Machines. Are real Xenoarchaeologists with military training. As comfortable with a Marham Assault Rifle as they are with a trowel.

f. Government appointed observers/surveyors. (Bureaucrats and busybodies. But a necessary evil if you're running a *legitimate* dig.)

5. Sponsors for "digs"
   a. Corporate
   b. Government, high security clearance
   c. University
   d. Self-funded
   e. Organized Crime
   f. Crowdfunding

6. Preparing for a dig: Where do you look? What do you use? How do you get there?
   a. Research any previous surveys of the target star system and nearby stars. Planets with one or two major sites might have other places that you can investigate.
   b. Planetary Telescope Surveys (Surveys cost, so self-funded and crowdfunded can just afford i, ii, and maybe iii. Every so often iv. If going to a known planet, this can be completely skipped. Just read the reports from the previous expeditions.)
      i. Determine where and what type of planets are in the target star system.
      ii. Allows for preliminary mapping of the target world.
      iii. Spectrographic surveys of the atmosphere, looking for composition, breathability, signals gathering, surface anomaly detection, and trace pollutants from previous civilization.
      iv. Locate any moons in orbit around the world and search for signs of mining operations.
      v. Locate any large space colonies in orbit or at Lagrange Points. (10 - 15 LY max)
      vi. Locate any signs of asteroid mining.
   c. Apply for the permits for legal operations. (Obviously, raiding and pot stealing, no permits necessary.) May take upwards of a year or two to get permission. (Does not apply to Government expeditions.)
   d. Assemble the Expedition.
      i. Corporate, Government, University, Organized Crime:
         1. Personnel Starship (Stays in orbit)
         2. 2x Cargo ships (return back to the civilization after leaving gear.)
         3. ICL Patrol Ship (Government only)
            Corporate and University expeditions might want to consider requesting periodic visits by ICL Patrols ships. Chances of the Patrol actually catching the Jacks in the act are slim, but at least they'd try to avenge your death. The Patrol can also rescue you if you accidentally (or stupidly) activate some paleoxenotechnology gadget which renders your ship inoperative or otherwise maroons you.
         4. Enforcer Gunship (Corporate & Organized Crime only)
            Enforcer Gunships are refitted cargo ships. Seen primarily on the fringes of Known Space, they remove cargo capacity to carry various weapon systems. They are not a warship, just the equivalent of a semi-truck outfitted with a vulcan and rocket launchers. One hit from a real tank and it's gone.
         5. Flatpack inflatable orbital port.
         6. Automated defense satellites
         7. Orbital survey satellites
         8. Landing probes/rovers
         9. Propellant processing plant, planet based.

10. Cargo shuttle
11. Flatpack inflatable ground base
12. Ground vehicles
13. Air vehicles
14. Archaeological excavation robots
15. Archaeologist tools
16. Subsurface scanners and support equipment
17. Xenoarchaeological containment systems
18. Weapons, sidearms, rifles
19. Food, water, nutrients for 1 year.
20. Crops.
21. Vacc-proof greenhouse, inflatable.
22. Xenobio containment, Andromeda Class preferable.
23. Hire professionals for all roles:
    a. Xenoarchaeologists
    b. Security
    c. Base Camp Operations
    d. Orbital Port Operations

ii. Self-funded, Crowdfunding (Aspires to the above, but not enough funds):
1. Lease/charter a ship if you don't own one already. (Costs money if you stay longer than planned.)
2. Hope ship comes with a shuttle.
3. Secondhand Propellant processing plant.
4. Weapons, hopefully
5. Apply to the ICL (Interstellar Court of Law) for a visit or two by an ICL Patrol ship. (The ICL is just a version of the Space Patrol from the RPG FTL:2448.)
6. Archaeologist tools
7. Lots of baggies of all sizes, lots of plaster of Paris and cloth bandages.
8. Some ATVs or Sky Bikes.
9. Lots of Pot Noodles and Phood. (Phood is a vegetable/fungal based food product.)
10. Personnel:
    You and anyone you can get to go on this expedition. If crowdfunded, top supporters may be going with you as a perk. (This includes that one one crazy psychic dude that coughed up a lot of money.)

iii. Pot Stealers, Jacks, Jumpers, Tomb Robbers/Raiders, and Indiannas
1. Starship with weapons.
2. Shuttle with guns
3. Guns.
4. Industrial excavators (optional)
5. Bunch of guys with guns.
6. That map or widget that everyone overlooked but provides the vital clue to the site.
7. Pot Stealers, Tomb Robbers/Raiders, Jacks, and Jumpers might want to spend money on spies and stool pigeons inside universities, to get tip offs of university planned expeditions. Or otherwise spend money to find prior xenoarcheology sites to scavenge or raid.

iv. Combat Archeologists

1. Government:
   a. ICL Pharoah Class Combat Archeology Assault Ship. Designed for planetary bombardment with fusion warheads. Has six Kymnarian Hrass-Phiss Assault Drop Shuttles. Lots of weapons all around. (Kymnar are a species of sentient felines. From the game FTL:2448.)
   b. Crack team of Combat Archeologists.
   c. Assault Troops.
   d. Armored Personnel Carriers.
   e. Autonomous Air Assault Drones w/deadman systems in case they are taken over by someone else. (A dead simple relay controlled by a simple radio receiver cued to a specific radio sequence, entirely independent of the more sophisticated controls in the drone. Receives the signal, relay closes, igniting just enough thermite to burn out the control system. Drone drops from the sky.)
   f. Memetic Vision/Audio Hack projection. (See *Snow Crash* by Neal Stephenson)
   g. Wildfire Containment System Pod with independently controlled thermonuclear self destruct device in the megaton range.
2. Corporate:
   a. A cargo ship completely refitted with asteroid movers, non-nuclear missiles (officially), several refurbished FedEx Expedited Delivery Shuttles upgraded with weapons.
   b. Pretty much the same ground presence as a Government team. 6.d.iv.1.b-f.
   c. A Memetic Threat Level Containment System Pod. Does not have a self destruct, but is usually orbited within sight of ship's weapons.
   d. Andromeda Class Bio containment pod, also in sight of ship's weapons.
   e. Expedition Operations:
      i. Corporate, Government, University, Organized Crime:
         1. Star System Survey. Looking for artificial satellites, moon bases, abandoned ships. This is done from the outer system.
         2. Planetary Survey, includes moons:
            a. Determine if any sophonts are still present on the world.
               i. If sophonts are present, do they pose a threat?
               ii. Are they the original inhabitants? That is, are they a known species?
               iii. After landing and you've made contact, do they know of ancient sites?
               iv. If spacefaring, leave a couple of deep space satellites and leave.
            b. Wide Scan surveys looking for regular features in the topography.
            c. LIDAR and Radar scans of areas of interest, determining if ancient structures exist.
            d. Ground Penetrating Radar to confirm structures.
         3. Identify potential sites and evaluate.
            a. City ruins are definitely potential sites, but are also very dangerous.
            b. Large Structures will be scanned to determine if still in operation. If so, avoid. (Follow up by a Combat Archaeologist Team)

        c. You find a Great Machine. Leave star system. Let the ICL know. A task force will be dispatched.

4. Send ground probes/rovers to top 20 sites. (Rovers are not retrieved.)
        a. Determine biocompatibility of local fauna and flora.
        b. Using various sensors, survey the site.
        c. Act as claim beacons.

5. Narrow to top 5 sites, and then send teams to each to do an initial survey.
        a. Walk the site and look for anything missed by the rovers.
        b. Do a test trench to determine feasibility of site for a full dig.
        c. The best looking site will be the main dig. If there is time, #2 and #3 will be investigated.

6. Orbital sites:
If the native sophonts had space launch capability, there might be old space probes and other space junk that accumulated at the Lagrange points of any and all of the major planets in the system.
        a. Determine if they are intact. If so, find a safe way to interact with or if spacecraft of some sort, enter and not destroy anything of value.
        b. Orbital colonies most likely will be barren and lifeless. Breathing gear will be necessary.
        c. Determine how functional the station or ships are. They will not be flyable.

7. The Dig. Includes sites on moons.
        a. The site will initially cleared by robot excavators. Once they reach the level containing the structures and artifacts, the work continues by hand. All excavate soil is sifted for artifacts.
        b. Xenoarchaeologists dig the site and sift every grain of sand and dirt for artifacts. All items are recorded in 3 dimensions and on a grid. No items are removed until their context is fully recorded.
        c. Any tombs will be probed by mini drones and fiber optics before opening.
        d. Once context is established, items are carefully removed, some still in the soil they were found in. Lots of work on making sure the artifacts stay intact.
        e. Rinse and repeat. This process is done on a grid basis, over and over until they reach a layer that no longer contains items of interest. Such a dig can take upwards of four to five years. Some are still being investigated forty years later.
        f. Items of technological interest are kept separate from the rest. These will be fully studied back home.

8. The Handwave: Obviously, this is the boring stuff the big boys do. Everything is regimented and done according to protocol and regulation, even for Organized Crime. It's good to know what the professionals do at a dig, because the players won't be doing them.

ii. Self-Funded and Crowdfunded:
1. Do an orbital survey of the target world.
2. Stare at all the data you got, and then just pick one.
3. Land and start digging!
4. Found something! Will it pay for the expedition with profit?
        a. Yes, you're done, go home and reap the rewards!
        b. No, keep digging.

      5. Find an operational installation or, gasp, a Great Machine!
        a. Ka-Ching! Let's go inside!
        b. And the adventure begins.
   iii. Combat Archeologists (Both Government and Corporate)
      1. Review the reports by the survivors, if any, and determine the level of the threat.
        a. If the threat poses an immediate danger to civilization, nuke it. (Corporations move a couple convenient asteroids into collision orbits.)
          i. If the threat shrugs off the nukes/asteroids retreat in a random direction and then call in the fleet.
        b. If no imminent threat, send in two shuttles, one with assault troops, one with combat archaeologists to the site.
      2. Attempt to neutralize the threat. How you neutralize a threat depends on what the threat is. Xenomorphs? Nuke them from orbit, it's the only way to be sure.
      3. If you fail, retreat. Shoot anyone who behaves oddly or out of character.
        a. If the troops are pinned down, send in two more shuttles worth of troops. (The last two shuttles on a Pharaoh Class ship are design to bomb sites with neutron devices. They then return, and the ship proceeds with orbital bombardment. See point 3.)
      4. Succeed, make sure it's not playing dead. If it's really dead, place in the Wildfire/Memetic containment pod that lands on the planet.
      5. Through remote devices with memetic filters, research with a finger ready to push the kill button.

7. How old is it?

The biggest question about any finds is "how old is it?" That can be a difficult question to answer. While there are literally two dozen absolute dating methods and just about as many relative dating methods, they all require some form of calibration. That means finding some way of establishing the natural variation and rates for the different methods.

  a. There are two kinds of dating: Absolute and Relative:

    Absolute: Uses absolute referent criteria, and mainly include the radiometric dating methods.

      i. The favorite dating method for finds under 50,000 years is radiocarbon dating. But this requires some independent method of establishing the concentrations of C14 over the millennia. On Earth, this was tree ring dating. If the world you're on doesn't have things that grow like trees, but grow more like bamboo, then there's no yardstick to calibrate with. Still, it will give you an educated guess at the age of something, but with big error bars.

      ii. Other forms of radiometric dating might be easier to use. You just need to determine the percentage of the parent isotope in the star system, and from that you can determine how old something is. The only downside, is that outside of C14 dating, you can only date something to within a million years or so, 80,000 at a minimum.

  b. Relative: These methods are unable to determine the absolute age of an object or event, but can determine the impossibility of a particular event happening before or after another event of which the absolute date is well known.

      i. Paleomagnetism can be used to get a relative date and allow you to determine if a find is older than other finds. But it really can't tell you how old.

      ii. Corrosion rates of various metals, in particular lead, can give you a relative date. But because this requires that the metal stay exposed for the entire duration.

  c. But the best rule of thumb, the older a thing is, the deeper it is. Of course erosion can expose old objects, but a good geologist will let you know that that had happened.

8. Types of xenoarchaeological finds
    a. Garbage, lots of it, 99% of all finds are garbage. But garbage is still good for knowledge and understanding of the culture. Just not profitable.
    b. Ruins, lots of them.
    c. Broken devices, but mostly intact, rare.
    d. Semi-operational devices, mostly found in space or airless worlds.
    e. Operational devices, just lacking power, really rare and almost always in space.
    f. Great Machines.
        Great Machines are massive devices created by the ancients for some task. Typically have their own power source or means to "refuel" itself, and is usually the last remaining piece of kit from a forerunner race. Every one of them are a disaster just waiting for someone to push a button or think a bad thought.
        Examples:
        i. The Krell Machine from Forbidden Planet.
        ii. The Berserkers from Fred Saberhagen's self same series of stories.
        iii. The Great Machine of Epsilon III in orbit around Epsilon Eridani in Babylon 5.
        iv. The Doomsday Machine from TOS: The Doomsday Machine.
        v. The Pleasure Planet from TOS: Shore Leave
        vi. The Tar-Aiym Krang by Alan Dean Foster, Flinx - Humanx Commonwealth series
    g. Plague Worlds
        These are worlds where various forms of technological advances have occurred and it's not advisable to even orbit these worlds any closer than 5,000 km. Types of Plague Worlds:
        i. Nanocalypse: Nanomachines have taken over. Not necessarily Gray Goo worlds. More like Nature gone Nano. *Dirty Pair: Sim Hell* by Adam Warren has an example of an Nanocalypse. Blood Music by Greg Bear.
        ii. Gray Goo worlds: Nanoreplicators have succeeded in turning the top 5 km of the world's crust into more nanoreplicators. An extreme example of paper clip optimizers.
        iii. Death Worlds: Biological modification taken to its illogical extreme. Every creature on this world will try to kill you in the most horrific means possible. The Alien franchise is an example of this, as is the Deathworld series by Harry Harrison.
        iv. Singularity ascended: Massive machines edifices, fed by various power sources. Perfect melding of mind and machine, there's no life on this world that wasn't digitized when the Singularity event occurred. Will forcibly try to "ascend" anyone who gets close enough to one of these machines. *Newton's Wake* by Ken MacLeod.
        v. Singularity failed: Far more of these than of the ascended version. Turns out it's hard to put a sophont mind into a machine. Those few that were successful, found themselves the minority, and the rest of civilization fell into ruins. Most of their "great machines" have crashed because of design flaws. That doesn't stop the still-working ones from trying to assimilating anyone who gets too close…
        vi. Memetic Apocalypse World: The native population is wiped out by a memetic hack that went viral. A memetic hack, attacks the brain of a sentient through its senses, primarily through visual or auditory senses. Thankfully, a memetic hack for one species may not have the same effects on Humans or their allies. That does not mean they would be unaffected. They may become homicidal maniacs out to kill their fellow team members. Or they get one wicked migraine that never goes away until they receive memetic therapy. *Snow Crash* by Neal Stephenson is an example of such an attack.
    h. Fallen Cultures
        Places where there are still locals about, but they have fallen far down and can't get back up.

i. Cultures that gave up on the whole technology thing and have gone back to basics. Live amongst the ruins of their forefathers and pretty much ignore them. The Maya on our own Earth.

ii. A declining culture that once had hit the heights, and now just waiting for everything to end. Typical of a species that never succeeded in discovering an FTL drive and was stuck to their own stellar system. Space is BIG. Might be us in the end.

iii. Very rare, a culture that is in the process of destroying itself. War, weapons, big booms, the whole enchilada. Fun to watch while eating popcorn, but not advisable to get involved with. Not that ever stop anyone. Too many Star Trek shows to mention. H.Beam Piper's *First Cycle*.

iv. Fifth cycle cultures are a society that has boom and bust cycles, but manages to put itself back together after each bust cycle. Moties from *The Mote in God's Eye* are an example of such a culture.

v. Pet/Legacy worlds, places where the pets were enhanced to make them smarter, then master went away. They evolved and are trying to emulate lost master. Or a Legacy world of a dying race, lab experiment, uplifting, or reparations for previous misdeeds by said race. May be monitored by the likes of Shadows and Vorlons and other Elder Races who are not as extinct as the xeno team would like. Example: *Planet of the Apes*, *Albedo*, *Babylon 5*, Brin's Uplift series, *Epilogue* by Poul Anderson, as well as others.

vi. "Burnt-off" Worlds, planets where the inhabitants killed themselves off in a cataclysmic nuclear war, in the process, coating the surface of the planet with a thin sheet of green-black glass. Artifacts will be more rare, more scorched, more melted, and more radioactive. Archeologists will need anti-radiation and decontamination gear.

i. Big Dumb Objects
Large structures found typically in space. May also be Great Machines, but in many cases, just BDOs.

    i. STL generation ships, vessels sent on a trip that would last centuries or even millennia. Examples: Metamorphosis Alpha, Rama, The Starlost, Universe (Heinlein's novel), the ship Yonada from the Star Trek episode "For the World Is Hollow and I Have Touched the Sky".

    ii. Space Colonies, O'Neil Cylinders and other large space colonies. Most are dead due to the fact that their ecology is balanced on a knife. One example are the Halo worlds from the game of the same name.

    iii. Battle Stations: Death Stars, World Killers, V'Ger, really big objects, most really dangerous.

    iv. Planetary scale structures: Ring stations around a planet, massive planetary shield, basically a large "bottle" that holds a planet inside. Examples, the ring station in *Dirty Pair: Project Eden*, the planetary shield around Druidia in *Spaceballs*, the hourglass shaped world of Prester from the anime series *Last Exile*.

    v. Solar system scale structures, such as Ringworld, an Alderson Disk, and Dyson Spheres.

    vi. Interstellar objects, such as a Topopolis, a many light years long tube that rotates producing centripetal gravity on the inside. A mega Dyson Sphere surrounding multiple stars or even a galaxy.

9. Suggested Reading and Watching:
    a. "Omnilingual", 1957 H. Beam Piper
    b. *Rendezvous with Rama*, 1973 Arthur C. Clarke
    c. *Strata*, 1981 Terry Pratchett

d. *Ringworld*, 1970 Larry Niven
e. *Gateway*, 1977 Frederik Pohl
f. Heritage Trilogy, 1998-200 Ian Douglas
g. *Newton's Wake: A Space Opera*, 2004 Ken MacLeod
h. *The Carpet Makers*, (German: *Die Haarteppichknüpfer*) 1995 Andreas Eschbach
i. Congo, 1980 Michael Crichton
j. *Secret of the Incas*, 1954, Starring Charlton Heston
k. Indiana Jones movies, starring Harrison Ford