Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

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Inside the ocean's oil making machine

Oil from the ocean! A few people who read my first column were surprised to learn that the creation of oil starts with life in the ocean. But why doesn't oil form in the oceans everywhere? If it did, oil would be easier to find and we'd probably spend a lot less on gas. Unfortunately, it's not so simple.

To begin with, the massive blooms of plankton required to generate the organic matter that eventually becomes oil do not occur everywhere in the oceans. Only in certain areas did it all come together geologically, and those are the places that today hold the world's largest oil deposits. Curiously, six of the seven countries with the largest reserves of oil are all in the Persian Gulf: Saudi Arabia, Iran, Iraq, Kuwait and United Arab Emirates.

Why did so much oil form in the Middle East? To answer this we need to go back about 150 to 200 million years, when the distribution of land and sea was quite different than it is today. Most of the continents appear to have been united into one large land mass known as Pangea. The Atlantic Ocean hadn't yet opened up, so North America was connected to Europe, and South America was joined to Africa.

The area stretching eastward from this mega-continent, at about the present location of the eastern Mediterranean, was a vast sea known as the Tethys. This warm body of water straddled the equator and was extremely fertile. Plankton bloomed in profusion, and for centuries the dead bodies of these tiny creatures sank to the seafloor and collected there. With little oxygen in the overlying water, the organic matter wasn't oxidized or broken down, so it accumulated to great thicknesses. The increased pressure and temperatures at depth over millions of years gradually converted the organic matter to oil.

About 200 million years ago, as the plates began to break up and the continents shifted, Africa and India pulled away from South America, Australia and Antarctica and began slowly migrating to the north. As these large land masses traveled north toward Asia, they began to compress the Tethys Sea, squeezing and folding the thick layers of sediments with their rich deposits of oil on the floor of this ancient ocean. The waters of the sea drained to the east and west, but the

compressed and folded oil-rich sediments became the mountains and deserts of Saudi Arabia, Kuwait, Iraq and Iran. So an accident of plate tectonics made billionaires out of the Saudis, enabling them to trade in their camel for a Mercedes.

Although the United States originally had significant oil deposits, what remains today is only a small fraction of what lies beneath the sands of the Middle East. Our appetite for petroleum, however, is huge. The United States uses about 21.5 million barrels of oil every day. About 60 percent of it is imported, much of it from politically unstable areas. Americans use about 400 million gallons of gasoline every day, about 4,600 gallons a second. If lined up in 1-gallon cans along the equator, this daily usage would completely circle the earth over six times.