Episode: 94
Title: Oil and Water
Topic: Oil spills

Aubrey Paris (AP): What's up, everyone, welcome back to The Forum, where science comes to socialize. My name is Aubrey and I'm joined, of course, by my co-hosts Cleo and Daniela.

Cleo Warner (CW): Hey, all. I'm Cleo...thanks for joining us today. Let me be the first to remind you that you can chat with us online using our Twitter and Instagram handle, @ISGPforum, and we're also on Facebook at facebook.com/ISGPforum. So be sure to check those out.

Daniela Baeza (DB): Hey there, Daniela here. Last but not least, don't forget to visit our website, ISGPforum.org, where you'll find all our awesome media content in one place.

AP: So normally we'd ease our way into the day's topic of conversation at this point, but today we have so much to get through, including *three guests* to welcome—which we'll do in just a little bit—so let's get down to business.

CW: Shall we set the scene?

AP: Absolutely.

DB: The day was March 24, 1989, a solid few years before any of us were born. The day before, an oil tanker left an Alaskan port *en route* to Long Beach, California, the land of surfer bros and fish tacos. On board the ship were—I don't know, probably some people—but more importantly, 53 *million* gallons of crude oil.

AP: We all know what happened next, since even though we weren't even born at the time, the story is infamous. Within hours, the Exxon Valdez hit a reef in Prince William Sound, wrecking the boat's hull and spilling 11 million gallons of crude oil into the water. It was the largest oil spill in United States history...until 2010.

DB: We were all definitively born by that point.

AP: Yes, in high school, to be exact.

CW: What *happened* in April of 2010 would end up dwarfing the Exxon Valdez spill. Deepwater Horizon, an oil drilling rig, exploded in the Gulf of Mexico off the coast of Louisiana, resulting in the release of more than 200 million gallons of oil into the waterway. You might know of this

incident as the BP Spill, which now probably steals the title of "most infamous" from the Exxon Valdez event.

DB: The takeaway is this: oil spills are an enormous threat to the environment, and people, and animals, and just about everything we care about in this world. So, what causes them, how frequently and where do they occur, and how do we clean them up?

CW: Plus, what can *you* do if you notice an oil spill in your area? Are you even likely to see a spill in your area—you know, if you don't live in the middle of the ocean?

AP: We'll be discussing all that and more right here, right now in today's episode on oil spills. To help us out, we'll be talking to three folks from the U.S. Environmental Protection Agency, better known as the EPA. We have Dr. Robyn Conmy, a research scientist at the EPA, as well as Mr. Jeff Kimble and Mr. Jon Gulch, both of whom are On-scene Coordinators in EPA's Region 5.

CW: Region 5, by the way, covers Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin, and the lands of 35 tribes. So, if you're a geography buff, you'll note that this includes the Great Lakes.

DB: So, to get started, I think it's important to acknowledge the mental image most of us have when we think about an oil spill. I, for one, immediately think of wildlife covered in thick, black oil...and since the BP event is firmly nested in my brain, those mental-image animals are probably alligators or whatever other creatures stereotypically live in Louisiana.

AP: I know you're trying to be funny, but that's kind of a valid image. *But* it's not the only or even the most realistic image...*if* you're thinking about what types of spills are most common, or *where* they're most likely to occur. For more on what constitutes an oil spill, here's Dr. Conmy.

Robyn Conmy (RC) (3:59): Oils spills can be releases of any type of oil. People generally think of petroleum, but it can be mineral, vegetable, or animal, and that's through the guidance that we have under the Oil Pollution Act. Spills occur in many different places, over land, over water—that can be freshwater or marine waters—and people also tend to think a lot about big ocean spills and less about the more frequent and very close-to-community spills that happen in inland waters. EPA has established requirements to report spills in navigable waters or adjoining shorelines, where discharges of oil in quantities that *might* be harmful to public health or the environment, can include things that violate water quality standards, can cause a film or sheen, or cause sludge or emulsions beneath the water surface. All of those stem from something called the Discharge of Oil Regulation and, affectionately, it is called the "Sheen Rule." So, it's not so much a limited, known volume, but more about, was a sheen formed during release?

AP: That means that an oil spill actually isn't qualified by the *amount* of oil spilled. In the simplest of terms, if we have at least an oil sheen present, we've got a spill.

DB: *And* I really want to emphasize that a spill can happen in the water *or* on land! I feel like that's a little-known fact.

CW: You're probably right about that. According to Mr. Gulch, a spill can occur literally *anywhere* there's a potential source. That means boats and rigs—like we saw regarding the Exxon Valdez and Deepwater Horizon incidents—or railroads, leaking storage tanks, pipelines, and oil wells that are known, unknown, or abandoned. And unfortunately, the location of a spill doesn't necessarily define where it's impact will be.

DB: Part of the trouble with oil spills is the fact that they spread...you know, the cardinal rule of "liquids" from middle school science. So, let's say a spill from an eighteen-wheeler leaks into the sewer on the side of the road. No big deal, right?

CW: Uh, wrong!

DB: Wrong, for sure. That's because the sewer might lead to a small waterway, which could lead to a bigger waterway, which can impact everything from drinking water supplies to local wildlife. But more on impacts later.

AP: For now, it's important to realize just how common oil spills actually are. According to Dr. Christina Swanson, who was featured way back in Episode 53 of our show and is currently the Director of the Science Center at the Natural Resources Defense Council, or NRDC, oil spills of various magnitudes happen just about every day around the world, adding up to more than a million gallons in a typical year.

CW: At this point, you might be like, umm, I'm very well-versed on environmental happenings because I'm, like, hella woke, and I for sure don't hear about daily spills…

AP: But that's because only the biggest spills make the nightly news.

CW: Or your Twitter feed.

DB: Mr. Gulch pointed out that smaller spills are caused by accidents, poor housekeeping at oil-related facilities, or even carelessness when a company of any kind goes digging without calling the proper authorities first. Another big problem is *intentional* dumping.

CW: In Region 5—remember, that includes the Great Lakes—there are around 15–20 oil spills each year that require the EPA's efforts. Now, these spills don't tend to be in the millions-of-gallons range, thankfully, but their magnitudes do vary considerably. So, as an example, a smaller spill occurred in Archbold, Ohio, relatively recently. The magnitude of this one was about 300 gallons of oil, which was dumped into a creek.

DB: The EPA wasn't able to solve the "whodunnit" of that spill, but they did determine that it was most likely a case of intentional dumping.

CW: Despite the fact that this spill occurred some 50–60 miles from Lake Erie, this particular creek led to a larger river, which led to a navigable waterway spilling directly *into* Lake Erie.

AP: It's not hard, then, to imagine how even a small spill in what at first seems to be a remote area can damage drinking water supplies or larger plots of wilderness. But bigger, more direct spills happen inland, too. Mr. Kimble gave us a pretty good example of what he calls "the largest spill you never heard of," which occurred in Region 5. In 2010, the Enbridge Pipeline Spill dumped an estimated 849,000 gallons of oil into Michigan's Talmadge Creek, which is a tributary of the Kalamazoo River.

DB: It ended up being probably the largest oil spill to ever hit a freshwater, riverine ecosystem in the United States.

CW: And I've never heard of it. *How* have I never heard of it?

AP: I actually asked my friend who's from Michigan if *she* had ever heard of it, and she hadn't; don't feel bad, Cleo. Turns out you and most everyone else never heard of Enbridge because of *timing*.

DB: That's right! It happened at almost the *same time* as the BP Deepwater Horizon incident in the Gulf, so that's where the news coverage went.

CW: Which is pretty crazy, given the severity of the Enbridge event. Listen to Mr. Kimble describe its impacts and magnitude.

Jeff Kimble (JK) (9:23): In terms of size, this was an inland spill that cost EPA approximately $63 million in oversight costs, as we directed the responsible party over four years to clean oil from the saturated soils where the pipeline broke. It was a pipeline rupture that caused this. There was about four acres of oil-saturated soils, 38 miles of impact to the river system, where we collected—or directed them to collect—approximately 766,000 gallons of liquid oil from the river. And also over the course of four years, they continued work and dredged or excavated tens of thousands of cubic yards of contaminated sediment from this river system in areas it had collected due to this being a tar sand, or oil that was heavy that sank and mixed in with the sediments.

CW: Good lord.

AP: Right?

DB: At this point, everyone *must* be wondering how these spills are even addressed, especially because it seems like there are a *lot* of variables to consider...ranging from quantity and type of oil spilled to its location.

AP: And there are more variables than that, but you're right. Let's walk through how a spill response actually occurs.
DB: It all starts when the National Response Center gets wind of a spill; then they dole out a spill report to the appropriate federal agency that will lead the response effort.

CW: In the United States, oil spill response efforts are authorized by the National Oil and Hazardous Substances Pollution Contingency Plan, or shortened to NCP, which was established in 1968. This, as well as the Oil Pollution Act of 1990, dictates how to respond to spills and what the role of each involved agency actually is.

AP: As it turns out, if the spill occurs in an inland zone, as was the case for the Archbold and Enbridge incidents, the EPA takes charge. But if the spill happened in a coastal area, like along the water's edge where boats travel, that generally falls under the jurisdiction of the U.S. *Coast Guard*. Sometimes spills are big enough that a unified command center is established to bring together federal, state, and even local entities to work together on the response.

DB: Once the lead agency is assigned, that agency tries to determine who caused the spill and then helps them get moving on a response effort...if the offending party hasn't already started on their own.

CW: And if they can't figure out "whodunnit"?

DB: In that case, the government steps in to at least start—if not complete—the cleanup effort.

AP: Which brings us to the next step...actually cleaning up the spill.

DB: Let's let Dr. Conmy kick off that discussion for us.

RC (12:07): Regardless of who is in charge of a spill and where it occurs, the goal for *everyone* is to respond as quickly as possible. The longer that oil stays in the environment, the more difficult it is to remediate or remove it. That's primarily due to the changes, both physical and chemical changes, that occur as the oil exists out in the environment and is weathered, and moved, and spread…that dictates what type of response options we can use, as well as what the starting oil source is.

AP: So, what types of response options do we have? Well, we won't get exhaustive with this list, but we can give you a few examples.

CW: According to Dr. Conmy, some of the most common tools using during a cleanup are mechanical. So in the case of a water-based spill, think of things like floating "booms" to contain the oil, or skimmers to actually start removing oil from the surface.

AP: And here's a fun fact: Did you know that sometimes responders can remove the oil in such a way that allows the oil to still be used?

DB: Wait, really?

CW: I had no idea.

DB: Yeah, neither did I.

AP: That makes three of us, but when that's possible, it means at least some of that oil isn't wasted, which is relatively feel-good, given the circumstances.

DB: But sometimes we can't skim off the oil, in which case a common solution is to burn it in place. And then for very specific marine spills at least three nautical miles from shore, chemical dispersants might be an option.

CW: Dr. Conmy acknowledged that chemical dispersants are fairly well heard of and often come with a controversial ring to them. But in reality, they're used pretty rarely in U.S. waters; we just hear about them because they're more likely to be used in the large, CNN-worthy spills.

DB: Right, dispersants would never be applied in freshwater ecosystems.

CW: There are also shoreline cleaners, which are less harsh chemical agents like detergents or surfactants that are pretty good at removing oil from—you guessed it—*shorelines*...but also rocks, walls, hulls of ships, and even some response equipment that gets pretty mucky. But of course, these sorts of decisions regarding cleanup tools and tactics *must* be approved; they're not just thrown out into the open environment willy-nilly. In this case, the decision is approved by a regional response team.

AP: But just because we have a lot of technical options does *not* mean the response effort is gonna be easy. There are *tons* of challenges involved, so let's hear from Dr. Conmy and then Mr. Gulch for the details.

RC (14:49): I'd love for you to walk away, and your audience to walk away, with the sense that each spill presents its very own unique set of challenges, from whatever the oil type is, to the temperature that's outside, to sunlight, to where the oil is moving if it's on water. There's no two spills that are ever the same. Our planning and our exercises help us a great deal for response, but no two spills are ever the same. So, one of the challenges, then, is that much of what we also learn about spill response and remediation occurs on the job during actual spills, because—although we do a lot of research, we do a lot of exercises—it's often very challenging to scale-up from something that we might learn about a response technology. For example, for a particular kind of oil, it's very difficult to scale-up from a laboratory bench to a mesocosm study, wave tank-scale study, to what really happens in the real world.

AP: So, it turns out that scale-up isn't *just* a problem for catalytic chemistry, which we discussed back in Episode 91. But there are other challenges to oil spill cleanup, too. Here's Mr. Gulch.

Jon Gulch (JG) (16:10): Other challenges associated include knowing what's downstream—what populations, habitats, things like that—and we're starting to deal in the last several years with some new products, new oils that we haven't historically responded to: ethanols, biodiesels, as Jeff talked about in the Kalamazoo River, sinking oils. And something new that we're dealing with is natural gasoline, which almost freezes upon impact but also has properties of oil. So, using science and trying to determine what the final cleanup decisions may be…on many spills we'll pull together a science committee just to look at, at what point are we doing more harm to the ecosystem trying to remove the last drop of oil versus maybe leaving some oil behind and letting the earth kind of heal itself, with monitoring and making those decisions about how clean is clean.

DB: So, it kind of turns into a cost-benefit analysis at some point.

AP: Mhm. But there was one other challenge that I found really fascinating and I feel we should mention here. It's a research challenge.

CW: ...which is why *you* thought it was interesting.

AP: I mean, maybe. I did start thinking about what it would be like to do my own research if I couldn't access the chemicals I needed. Anyway, Dr. Conmy noted that in order for researchers to figure out how a certain type of oil behaves in a particular environment, or what tools and technologies might be most effective at treating its spill, it's *super* important for researchers to have access to the actual oil samples. You know, for their testing purposes. It's kind of like trying to practice to be on Food Network's show *Chopped*, which gives contestants four completely disparate mystery ingredients to use in a single, cohesive dish. If you're going to be a contestant and you want to practice, you can practice all you want making food in the time spans given on the show, but there's no way you can be truly prepared without knowing what ingredients you're going to pull out of that mystery basket on the day-of!

CW: So, without exact oil samples, predicting outcomes or effective techniques is limited.

AP: Exactly.

DB: I see where this is going, I think. The oil companies don't want the researchers to have the samples?

AP: Actually, no! It's not that at all! Unlike the producers on *Chopped,* the industry folks *want* to be able to give researchers the samples but, administratively, it's not that simple.

CW: The EPA is the government, so they can't accept the samples for free. But industry just doesn't have a mechanism to sell oil in quantities smaller than a tanker.

AP: And clearly they don't need—nor can they store—a tanker.

DB: That sounds so easy to fix, though.

AP: It probably is, but it's just not high on the government's priority list, so it hasn't happened.

CW: And this seemingly simple challenge has had real-world impact. Check out our Facebook and Twitter accounts next week, because we'll be releasing an Episode Extra in which Mr. Kimble explains how this access problem impacted response efforts during the Enbridge spill.

AP: Perfect. Okay so, we're going to take a very short break, and when we get back, we'll discuss what's being done to address these challenges, as well as the effects of spills that really motivate these ongoing efforts. Stay tuned!

BREAK

AP: Welcome back, everyone, to The Forum's discussion on oil spills. In case you missed it, we're joined today by Dr. Conmy, Mr. Kimble, and Mr. Gulch, all of whom work at the U.S. EPA. Naturally, that means we're using the United States as a major case study today, but it should go without saying that oil spills happen literally all over the world.

DB: Totally. In fact, the largest oil spill of all-time happened in the Persian Gulf during the Gulf War in 1991. Canada's also no stranger to oil spills, having experienced at least eight major spills in the last decade. Just a simple Google search will reveal the ubiquity of the problem, with every single continent experiencing spills over the years.

CW: And that *includes* Antarctica.

DB: Yeah, no small feat.

CW: Fortunately, there's *tons* of research happening to improve oil spill prevention, planning, response, and cleanup efforts. In the U.S., all of these activities happen across federal and state government agencies, academia, and industry. Cross-sector engagement is relatively strong in the spill community.

DB: You could call it a *well-oiled machine*.

CW: Right?

AP: That's kind of dark in this case, though. Anyway, ongoing research efforts are about as broad-based as you'd expect based on the variability in spill types and remediation options. A few examples include enhancing shoreline cleanup approaches, improving the personal protective equipment available for responders, and using satellite or aerial imagery to help detect remote-location spills.

DB: And in the U.S., specifically, the Interagency Coordinating Committee on Oil Pollution Research, or ICCOPR, is a congressionally mandated committee that meets quarterly to identify research and technology needs in the oil spill space. Where do we have gaps, and what projects can we implement to fill them? That's the job of ICCOPR.

CW: It turns out that the more proactive we can be, the better, because the impacts of oil spills over both the short- and long-term are *super* dependent upon how quickly and completely the oil can be removed. Here's Dr. Conmy with more.

RC (22:24): The type and the volume of oil goes a long way for determining the behavior of oil that is released into the environment. A light oil, for example, would possibly float on water, but a heavier oil can sink, as given in the example earlier with the Enbridge oil spill. As weathering happens, a light oil actually can transition to a medium or a heavier oil because it becomes more viscous as the light ends evaporate off. And so, the timing of how long that oil sits in the environment changes what we can predict about its behavior, as a result. All of the different environmental variables become so critical: air temperature, water temperature, sunlight levels. All of these things—soil permeability—make a huge difference about the fate of the oil, and that, then, of course, determines what impacts or effects you can have.

CW: And to motivate everyone to get on board with hasty remediation efforts, here are just a few possible effects of oil spills, provided by Dr. Swanson from NRDC. First of all, harm can be caused to plants, animals, and ecosystems. We've all seen the Dawn soap commercials featuring the transformation of a sad duckling covered in sticky, black oil to a happy duckling with floofy feathers waddling into the water. I can't be the only one who cries at that commercial every time. While those commercials are extremely effective at tugging your heartstrings and have certainly made me think twice in the soap aisle at Target, they do reflect reality. In other words, oil can smother fish and aquatic invertebrates, coat fur and feathers, or kill animals that ingest it.

DB: And exposure to oil or ill-chosen chemical remediators might impact behavior, health, and reproductive capacity of animals in the long-term. But in case plants and animals don't do it for you, oil spills can affect people, too.

CW: Impacts on livelihoods and local economies are probably the most obvious. Within the first eight months of the Deepwater Horizon spill off Louisiana's coast, the Gulf's commercial fishing industry lost more than $100 million, and thousands of jobs were lost, too.

AP: Plus, people who live or work near a spill can be exposed to all kinds of fumes and volatile organic compounds...which, for context, are the types of compounds that we chemists only handle in controlled fume hoods. This was actually really relevant in the case of the Enbridge spill...let's listen to Mr. Kimble explain.

JK (24:55): So, again that example of the Enbridge pipeline spill, that material was a diluted bitumen, so in that instance you had a very heavy substance that they actually had to add

somewhere between 12 and 20 percent very light-end petroleum products into it to get it to even flow through the pipeline. In that case, when that spill happened, the first two weeks we had a very organic-heavy, floating oil that…we had air issues with that with benzene, responders had to wear protective equipment and respirators. And in a matter of a couple weeks, those volatile compounds evaporated or bled off, and the oil reverted back to the heavier constituents, which then sank in the sediments and sank in the river. So, we dealt with everything on that spill: floating oils, sinking oils, volatile compounds, and those heavy particles of oil…They broke up into particles almost the size of pepper flakes to a quarter in size, mixed in with the sediments, and we ended up dealing with that heavy material for four years, trying to get it out of certain areas of the river. And when EPA wrapped up our involvement on the project, it still wasn't done.

DB: I cannot believe that it took more than four years to clean up that spill.

CW: It had five or six years of impact when all was said and done. The longer-term aspects of the project were taken over by the Michigan Department of Environmental Quality in 2014, at which time there were *still* areas of the river that, if you stepped in the sediment, oil would come up from the bottom and create a sheen on the surface. Though, on the other hand, the smaller-spill example we gave in Archbold, Ohio...That spill happened in an October, but the impact was really gone by November. So, there are clearly many factors that go into determining what impacts we need to be concerned about, as well as their timelines.

DB: Based on all of these case studies, I think we have a really good idea about how the EPA, and even the Coast Guard for coastal spills, is involved in research, planning, and cleanup. But it's worth mentioning that the EPA has some other roles in this space, too. According to Mr. Gulch, the EPA has certain responsibilities writing regulations for industry, not to mention inspecting response plans.

AP: In this case, the EPA is a unique animal in that it's filled with feedback loops that help improve preparedness. In other words, the research arms can provide the policy makers with sound scientific information, the responders can tell researchers what new information would improve remediation efforts, and so on and so forth.

CW: And of course, it can't even really be considered a feedback *loop* when considering just how many other actors there are that *work with* EPA and Coast Guard on these issues. Mr. Kimble explained that agencies ranging from NOAA to OSHA to U.S. Fish and Wildlife are all involved here. We also mentioned the Michigan Department of Environmental Quality, so each state often has its own agencies or at least rules when it comes to addressing spills.

DB: Again, these are examples from the United States. It goes without saying that other countries and regions have their own mechanisms. For example, the European Maritime Safety Agency, or EMSA, offers assistance to European coastal nations in the event of a spill. While the nation directly impacted is expected to take the lead in response efforts, EMSA has a "toolbox" of support options that can be used to supplement the response.

CW: Canada has a slightly different structure. Canada's National Oil Spill Preparedness and Response Regime gives a framework for addressing spills caused, in particular, by ships. It puts the formal burden of spill response on the company that causes the spill. The federal government, then, oversees the industry's remediation efforts.

AP: So, the strategies don't differ enormously, but there are definitely nuances such that, if you live outside of the U.S. and are interested in learning how spill response is facilitated in *your* country, we encourage you to do some research! And if you send it our way, we'll re-tweet you!

DB: One thing that's probably true regardless of geographic location, though, is that the first person to *notice* a spill probably *isn't* going to be the federal government or a formal response team. That's why, in the U.S. at least, EPA coordinators actively engage local emergency management teams, tribes, industry partners, and other groups in training activities so that they're ready to be the first responders on-scene at a spill. Here's Mr. Kimble with more.

JK (29:39): We're talking a lot about the federal response efforts and all the planning that we do in EPA, and Coast Guard, and our authorities, but one thing that the listeners need to remember is that most spills start local and end local. And although we're *emergency* responders, fire departments, policemen, other local staff that are *first* responders…sometimes they get to these spills long before we do. It's not uncommon for fire departments to be throwing out boom on creeks and rivers for us in an attempt to stop that migration before the federal actors can get there.

DB: Basically, it's a team effort.

AP: Yeah, for sure.

CW: Great, but can I be the bad guy here for just a sec?

DB: Yeah, what's up?

CW: So, I feel like, at this point, we have a solid handle on how different groups are involved in responding to a spill—plus all the bad stuff that can happen if a spill isn't handled properly. But that's just it...a spill is a *bad* thing. As much as I like the fact that industry actors do their part in cleaning up the messes they create, is it bad that I want to know how they're penalized? I mean, they *have* to be penalized, right?

AP: Yeah, I think that's a really fair point. According to Mr. Kimble, especially in the case of large spills, a monetary penalty can be assigned based on the number of barrels of oil spilled, the impact on the environment, and whether the spill was accidental or a result of negligence. As you might imagine, negligence is going to hike up the price.

DB: There's also something called the National Resource Damage Assessment, or NRDA, which quantifies the loss of wildlife, habitats, and natural resources as a result of a spill in the U.S. The Assessment is typically conducted by NOAA in conjunction with the affected states and tribes, and it results in a monetary penalty.

AP: Some penalties aren't monetarily based, though. One interesting alternative is for the offending company to pay for spill response exercises that engage all players in the emergency response effort. That kind of benefits everyone.

CW: Okay, I feel a little better now knowing that—what did you just call them, Aubrey? Offending companies? I like that—I feel better knowing that the *offending companies* are reprimanded in some way.

AP: Plus, don't forget that they're heavily involved in the cleanup effort itself.

CW: True that.

DB: So, what have we learned today? First and foremost, oil spills can happen anywhere. Literally *anywhere*. On land, in a small waterway, in a big waterway, you name it.

AP: There's a coordinated response effort for how spills are cleaned up, and that coordinated effort depends on the country you're operating in. In the U.S., the EPA or Coast Guard will be taking the lead.

CW: And both the efficacy and efficiency of the response are *entirely* dependent on how quickly the cleanup can occur. The sooner the better on all accounts.

DB: Plus, no two spills are the same!

AP: Last but not least, a large number of oil releases are first reported by people out and about in the community, like you and me! So, if you live in the United States and notice a spill in your area, please call the National Response Center Hotline at 800-424-8802.

DB: Be sure to let us know what you thought of today's episode; tell us what you learned! Plus, have you ever witnessed a spill, or helped in an oil spill cleanup? Tell us about your experience!

CW: You'll find us on Twitter, Instagram, and Facebook @ISGPforum, and our website is chock-full of goodies related to the show. Visit ISGPforum.org anytime to learn more, and don't forget that we're releasing an Episode Extra related to today's show just next week.

AP: Thank you so much to Dr. Conmy, Mr. Kimble, and Mr. Gulch for joining our show today, and thanks to Dr. Swanson for contributing her two cents, as well. And, of course, thank *you* for joining today's conversation. We'll catch you next time with a brand-new episode, right here on The Forum.